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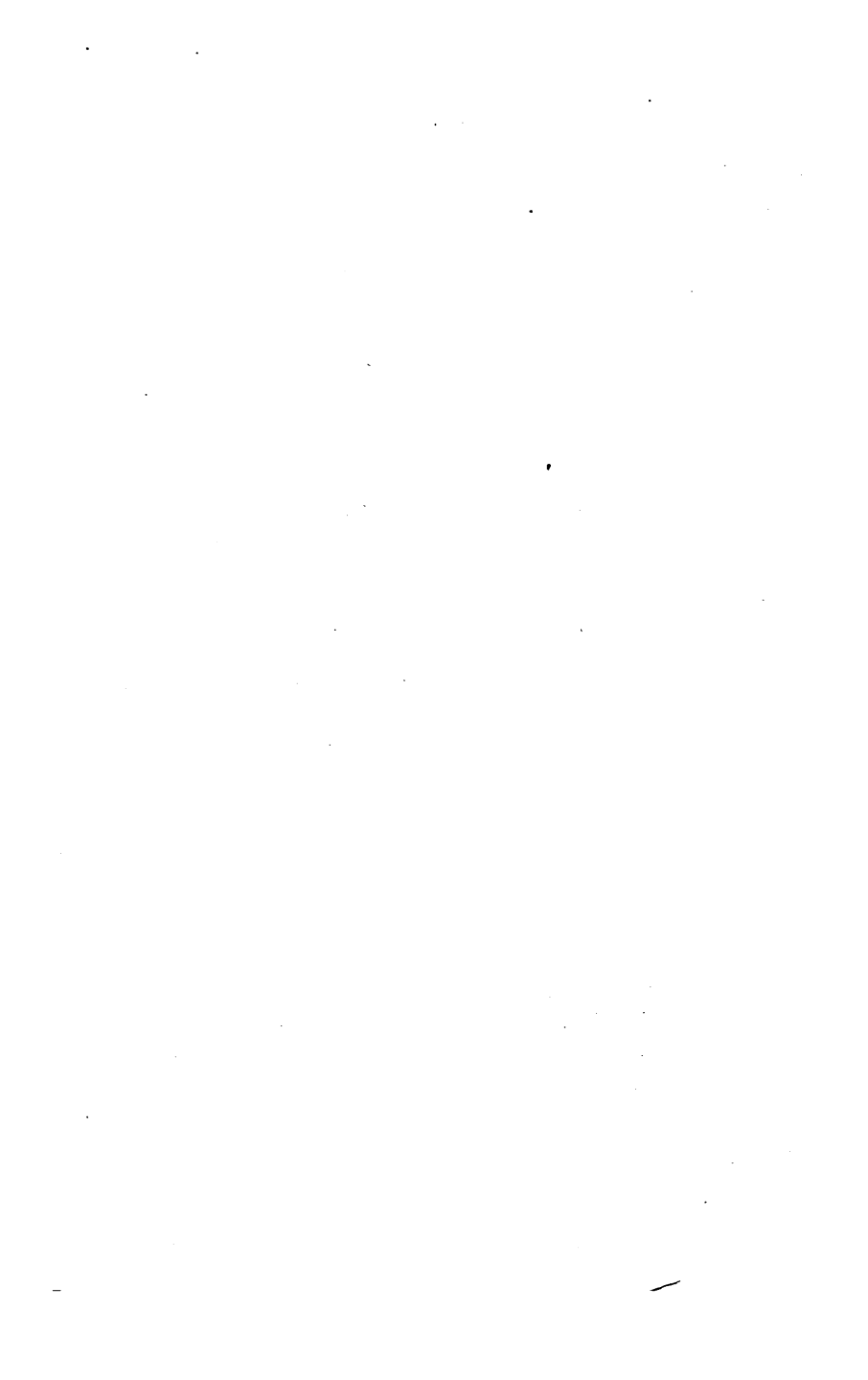




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# KEY

TO

*Charles* **DAVIES'**

## UNIVERSITY ARITHMETIC,

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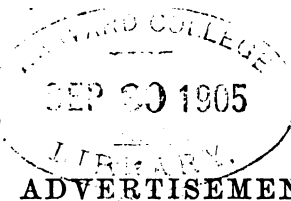
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By CHARLES DAVIES,

In the Clerk's Office of the District Court of the United States for the Southern District of New York.

## P R E F A C E.

---

It is not yet a settled question whether a Key to a Mathematical work is an aid or a hindrance. The diversity of opinion which exists on this point doubtless arises from the different *uses* to which a Key is applied. A Key should never be used to supersede investigation and labor; but always to turn the former into right channels, and to make the latter more available and effective.

How to study—how to investigate—how to labor—and how to teach, are the great questions; and it is these which a Key should answer.

It is not results alone that give value to a Key; but it is the explanation of methods—the examination of principles applied in the solution of problems, and a general and minute analysis of such questions as contain within themselves the germs of science.

It is also the province of a Key to lessen the *mechanical labor* of Teaching. Amid the various and complicated duties of the school-room, the teacher can scarcely find time

to work out every question on the slate or blackboard. In the Key he not only finds the best forms of analysis, but also the best arrangement of the work to be done; hence, he has a standard to which the work of his pupils should conform. He has only to guard against the danger of permitting his Key to become a *substitute* for a full and thorough investigation on his part, and he will avail himself of the general analysis and the best practical methods, without at all interfering with the independent operations of his own mind.

Great care has been taken to make a full and complete analysis of every question whose solution presents a new principle; and so to construct the analysis as to make that principle most apparent. It is believed that all the important forms of analysis have been given, and that all the classes of practical questions have been considered.

FISHKILL LANDING,  
July, 1864.



# KEY

TO

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(13)  
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(14)  
Sixty-five thousand and forty-two. *Ans.*

(15)  
Seven hundred and forty-two thousand, six hundred and four.

(16)  
Thirty-two millions, forty-five thousand, six hundred and seven.

(17)

Ninety millions, four hundred and sixty-four thousand, two hundred and thirteen. *Ans.*

(18)

Forty-seven millions, three hundred sixty-four thousand, two hundred and ninety-one. *Ans.*

(19)

Four billions, thirty-seven millions, nine hundred and two thousand, one hundred and sixty-nine. *Ans.*

(20)

Ninety-one millions, forty-six thousand, three hundred and two.

(21)

Seven hundred eighty-four millions, two hundred thirty-six thousand, seven hundred and four. *Ans.*

(22)

Seven billions, four hundred and three millions, twenty-six thousand, and fifty-four. *Ans.*

(23)

Twenty-one billions, seven hundred and four millions, eighty thousand, four hundred and ninety-five. *Ans.*

(24)

Twenty-one billions, eight hundred ninety-six millions, seven hundred and twenty thousand, four hundred and twenty-one.

(25)

Eight trillions, one hundred and forty billions, two hundred and ninety millions, three hundred and eight thousand and ninety-seven.

( 26 )

Eight trillions, five hundred and four billions, six hundred and eighty millions, four hundred and sixty-seven thousand, and twenty-three. *Ans.*

( 27 )

Ninety trillions, four hundred and three billions, forty millions, seven hundred and twenty thousand, one hundred and fifty-six. *Ans.*

( 28 )

One hundred and seventy-two trillions, three hundred and four billions, seven hundred and thirty-six millions, eight hundred and ninety-three thousand, two hundred and ten. *Ans.*

( 29 )

Thirty trillions, four hundred and sixty-seven billions, two hundred and fourteen millions, three hundred and two thousand, seven hundred and four. *Ans.*

( 30 )

One hundred and sixty-seven trillions, three hundred and twenty billions, four hundred and ten millions, three hundred and forty-one thousand, two hundred and four. *Ans.*

( 31 )

Two quadrillions, one hundred and sixty-four trillions, thirty-two billions, one hundred and eighty-nine millions, seven hundred and sixty-five thousand, four hundred and twenty-one.

( 32 )

47 000 069 000 465 207

( 33 )

800 000 000 000 429 006 000

(34)

95 000 000 000 000 089 089 306

(35)

6 000 000 451 065 047 104

(36)

*Ans.* 999 065 841 411

(1)

2; 7

(2)

7; 3

(3)

1; 7

(6)

 $426 \times 100 = 42600$  cents;  $426 \times 100 \times 10 = 426,000$  mills.

(7)

 $36 \times 10 + 8 = 368$  dollars. $368 \times 10 + 6 = 3686$  dimes. $3686 \times 10 = 36860$  cents.

(8)

 $8750 \div 10 = 875$  cents $875 \div 100 = \$8.75$ 

(9)

 $43 \times 10 + 3 = 433$  dollars. $433 \times 100 = 43300$  cents. $43300 \times 10 + 5 = 433005$  mills. *Ans.*

(10)

 $37 \times 20 + 9 = 749$ s. $749 \times 12 + 8 = 8996$ d.

(11)

 $1569 \div 4 = 392$ d. 1 far.; $392 \div 12 = 32$ s. 8d.; $32 \div 20 = £1$  12s.;£1 12s. 8d. 1 far. *Ans.*

(12)

 $7 \times 20 + 14 = 154$  cwt.; $154 \times 4 + 1 = 617$  qr.; $617 \times 25 + 20 = 15445$  lb.;15445 lb. *Ans.*

(13)

 $15445 \div 25 = 617$  qr. 20 lb.; $617 \div 4 = 154$  cwt. 1 qr.; $154 \div 20 = 7$  T. 14 cwt.;*Ans.* 7 T. 14 cwt. 1 qr. 20 lb.

(14)

 $4 \times 12 + 6 = 54$  oz.; $54 \times 20 + 12 = 1092$  pwt.; $1092 \times 24 + 7 = 26215$  gr.;*Ans.* 26215 gr.

(15)

$$704121 \div 24 = 29338 \text{ pwt. 9 gr. ;}$$

$$29338 \div 20 = 1466 \text{ oz. 18 pwt. ;}$$

$$1466 \div 12 = 122 \text{ lb. 2 oz. ;}$$

$$\text{Ans. } 122 \text{ lb. 2 oz. 18 pwt. 9 gr.}$$

(16)

$$5 \times 12 + 1 \frac{3}{4} = 61 \frac{3}{4} ;$$

$$61 \times 8 + 13 = 489 \frac{3}{4} ;$$

$$489 \times 3 + 1 \text{ } \textcircled{\text{D}} = 1468 \text{ } \textcircled{\text{D}} ;$$

$$1468 \times 20 + 2 \text{ gr.} = 29362 \text{ gr.}$$

(17)

$$174947 \div 20 = 8747 \text{ } \textcircled{\text{D}} \text{ 7 gr. ;}$$

$$8747 \div 3 = 2915 \frac{3}{4} \text{ } \textcircled{\text{D}} ;$$

$$2915 \div 8 = 364 \frac{3}{4} \frac{3}{4} ;$$

$$364 \div 12 = 30 \text{ lb } 4 \frac{3}{4} ;$$

$$\text{Ans. } 30 \text{ lb } 4 \frac{3}{4} \frac{3}{4} \text{ } \textcircled{\text{D}} \text{ 7 gr.}$$

(18)

$$6 \times 3 + 2 = 20 \text{ ft.}$$

$$20 \times 12 + 9 = 249 \text{ in. Ans.}$$

(19)

$$5 \times 8 = 40 \text{ fur. ; } 40 \times 40 =$$

$$1600 \text{ rd. ; } 1600 \times 5 \frac{1}{2} = 8800$$

$$2730 \div 12 = 227 \text{ ft. 6 in. ; yd ; } 8800 \times 3 = 26400 \text{ ft. ;}$$

$$227 \div 3 = 75 \text{ yd. 2 ft. ; } 26400 \times 12 = 316800 \text{ inches ;}$$

$$\text{Ans. } 75 \text{ yd. 2 ft. 6 in.}$$

$$\text{Ans. } 316800 \text{ in.}$$

(21)

$$56 \div 9 = 6 \text{ sq. yd. 2 sq. ft. Ans.}$$

(22)

$$355 \div 40 = 8 \text{ R. } 35 \text{ P. ; } 8 \div$$

$$4 = 2 \text{ A. ; } 2 \text{ A. } 0 \text{ R. } 35 \text{ P. Ans.}$$

(23)

$$456 \div 10 = 45 \text{ A. 6 sq. ch. Ans.}$$

(24)

$$3 \times 4 + 2 = 14 \text{ R. ;}$$

$$14 \times 40 + 8 = 568 \text{ P. ;}$$

$$568 \text{ P. Ans.}$$

(25)

$$14 \times 40 = 560 \text{ cu. ft. ; } 560 \times 1728 = 967680 \text{ cu. in. Ans.}$$

(26)

$$\text{Ans. } 31 \times 128 = 3968 \text{ cu. ft.}$$

(27)

$$56320 \div 128 = 440 \text{ cords.}$$

(28)

$$157 \times 4 = 628 \text{ qr. ;}$$

$$628 \times 4 = 2512 \text{ na. } \textit{Ans.}$$

(29)

$$192 \times 3 = 576 \text{ qr. ;}$$

$$576 \div 4 = 144 \text{ yd. } \textit{Ans.}$$

(30)

$$97 \times 4 + 3 = 391 \text{ qr. ;}$$

$$391 \div 5 = 78 \text{ E. E. 1 qr. } \textit{Ans.}$$

(31)

$$4 \times 63 = 252 \text{ gal. ; } 252 \times 4 =$$

$$1008 \text{ qt. ; } 1008 \text{ qt. } \textit{Ans.}$$

(32)

$$7560 \div 2 = 3780 \text{ qt. ; } 3780 \div 4 = 945 \text{ gal. ;}$$

$$945 \div 63 = 15 \text{ hhd. } \textit{Ans.}$$

(33)

$$7 \times 54 = 378 \text{ gal. ; } 378 \times 4 = 1512 \text{ qt. ;}$$

$$1512 \times 2 = 3024 \text{ pt. } \textit{Ans.}$$

(34)

$$74304 \div 2 = 37152 \text{ pt. ;}$$

$$37152 \div 2 = 18576 \text{ qt. ;}$$

$$18576 \div 4 = 4644 \text{ gal. ;}$$

$$4644 \div 36 = 129 \text{ bbl. } \textit{Ans.}$$

(35)

$$31 \times 4 = 124 \text{ pk. ;}$$

$$124 \times 8 = 992 \text{ qt. ;}$$

$$992 \times 2 = 1984 \text{ pt. } \textit{Ans.}$$

(36)

$$2110 \div 2 = 1055 \text{ qt. ; } 1055 \div 8 = 131 \text{ pk. 7 qt. ;}$$

$$131 \div 4 = 32 \text{ bu. 3 pk. 32 bu. 3 pk. 7 qt. } \textit{Ans.}$$

(37)

$$365 \times 24 + 5 = 8765 \text{ hr.}$$

$$8765 \times 60 + 48 = 525948 \text{ min. ; } 14 \div 7 = 2 \text{ wk. ;}$$

$$525948 \times 60 + 48 = 31556928 ; \quad 8 \text{ mo. 2 wk. } = \textit{Ans.}$$

$$31556928 \times 2 = 63113856 \text{ sec. } \textit{Ans.}$$

(38)

$$254 \div 30 = 8 \text{ mo. 14 da.}$$



## ADDITION.

(39)	(40)	(41)
19553068	43002168	10492
434495	48905879	10492
3204313	46007893	10492
400674		5976
<u>23592550</u>	<u>137915940</u>	<u>5976</u>

3 sons' shares.

2 daughters' shares.

43428 = children's shares.

1200

44628 = widow's share.

43428

88056 = fortune.

(42)			
27 mi.	3 fur.	36 rd.	
32 "	0 "	10 "	
36 "	2 "	0 "	
25 "	6 "	0 "	38 ft.
<u>121 mi.</u>	<u>4 fur.</u>	<u>8 rd.</u>	<u>5 ft.</u>

(43)	(44)	(45)			
8.75	5.375	5 hhd.	36 gal.	2 qt.	
5.625	12.03	3 "	15 "	1 "	1 pt.
3.125	.875	1 "	0 "	2 "	0 "
4.509	9.46		40 "	0 "	1 "
<u>\$22.009</u>	<u>\$27.740</u>	<u>2 T. 2 hhd.</u>	<u>29 gal.</u>	<u>2 qt.</u>	<u>0 pt.</u>

(46)	(47)	(48)
4798005	9219251	25840
7285817	10031283	3186
8224853	11319319	<u>\$29026</u>
<u>\$20308675</u>	<u>\$30569853</u>	

(49)		(50)
2870.43	476.25	79650
2346.75	476.25	25640
1563.82	476.25	9654
<u>\$6781.00</u>	<u>\$1428.75</u>	16835
1428.75		12642
<u>\$8209.75</u>		5685
\$8209.75 = price received.		<u>\$150106</u>

(51)	(52)	(53)
9375	11020855	51888882
1706	7970195	7852571
4824	14543789	67059
13280	14822870	<hr/>
529	1752316	\$59808512
<hr/> 29714	<hr/> \$50110025	

(54)				(55)		
	18 cwt.	2 qr.	16 lb.	84 A.	3 R.	26 P.
1 T.	5 "	0 "	21 "	120 "	0 "	14 "
		2 "	14 "	<hr/>		
2 T.	4 cwt.	2 qr.	1 lb.	205 A.	0 R.	0 P.

(56)	(57)	
25000.765	1375	4450
25000.765	1810	2975
25000.765	1265	<hr/>
<hr/> \$75002.295	4450 = yield.	\$7425 = value.

(58)	(59)	(60)
1 lb. 6 oz. 12 pwt. 0 gr.	389664	43
10 " 18 " 20 "	573234	1799
11 " 0 " 16 "	40722	<hr/>
1 " 0 " 14 " 12 "	49800	1842 years.
<hr/> 4 lb. 5 oz. 6 pwt. 0 gr.	<hr/> 1053420	

(61)	(62)	(63)
7500	5164.50	20.00
12865	11810.25	4.60
4680	3004.00	2.63
3296	2384.16	.875
4000	2384.16	<hr/>
<hr/> Ans. 32341	2384.16	\$28.105 Ans.
	<hr/> Ans. \$27131.23	

	(64)	(65)	(66)
	12 yd. 2 qr. 0 na.	9.25	12540.375
	16 " 1 " 3 "	45.50	5632.108
	10 " 1 " 1 "	110.75	5632.108
	<hr/>	<hr/>	<hr/>
	12.125	12.125	5632.108
<i>Ans.</i>	39 yd. 1 qr. 0 na.	3.20	5632.108
		<hr/>	<hr/>
		<i>Ans.</i> \$180.825	35068.807

	(67)	(68)	(69)
	£25 13s. 6d. 0 far.	13121498	825.875
	15 8s. 9d. 2 "	15367691	67.125
	18 0s. 0d. 0 "	11212616	80.10
	<hr/>	<hr/>	<hr/>
	14487351	46.00	
<i>Ans.</i>	£59 2s. 3d. 2 "	2981652	\$1019.100
		9414575	

	(70)	(71)
	\$7825 capital of 1st.	240 bu. 3 pk. 2 qt.
	1250	97 " 0 " 6 "
	<hr/>	<hr/>
	\$9075 capital of 2d.	42 " 1 " 0 "
	7825	
	<hr/>	<hr/>
	\$1690 = capital of 3d.	380 bu. 1 pk. 0 qt
	7825	
	9075	
<i>Ans.</i>	\$33800 = whole capital.	

	(72)	(73)	(74)
	300	£17 10s. 6d.	4750
	100.00	25 4s. 10d. 2 far.	695
	4.00	18s. 6d. 3 "	165
	.96	11 0s. 9d. 1 "	625
	.007	1 18s. 0d. 0 "	
	9.00	1 1s. 6d. 1 "	<i>Ans.</i> 6235
	.47	<hr/>	
	.005	<i>Ans.</i> £57 14s. 2d. 3 far.	
	40.000		
	3.000	(75)	
	.900	37° 34' N.	
<i>Ans.</i>	\$458.342	29° 16' S.	
		<hr/>	
		<i>Ans.</i> 66° 50'	

(76)

19 cwt. 3 qr.	582.68
22 " 1 " 18 lb.	83.24
16 " 2 " 12 "	166.48
24 " 1 " 19 "	<u>\$832.40</u>
83 cwt. 0 qr. 24 lb.	

83 cwt. 0 qr. 24 lb. = 8324 lb.

\$832.40 = 83240 cents.

83240 ÷ 8324 = 10 cents. *Ans.*

(77)

1656
427
430
479
476
536
1856
<i>Ans.</i> 5860

## SUBTRACTION.

(39)

10000.000
<u>1240.375</u>
\$8759.625

(40)

183701289
<u>34627</u>
183666662

(41)

17 yr. 9 mo. 1 wk. 6 da.
<u>10 " 11 " 2 " 5 "</u>
6 yr. 9 mo. 3 wk. 1 da.

(42)

144 lb	7 $\frac{3}{4}$	53	1 ♂
56 "	6 "	7 "	1 "
<i>Ans.</i> 88 lb	0 $\frac{3}{4}$	63	0 ♂

(43)

20.70
<u>12.50</u>
\$8.20

(44)

40.125
<u>.257</u>
\$39.868

(45)

15.700
<u>5.074</u>
\$10.626 <i>Ans.</i>

(46)

£133 11s. 9d. 2 far.
<u>11 14s. 9d. 1 "</u>
£121 17s. 0d. 1 far. <i>Ans.</i>

(47)

21 yr. 0 mo. 0 wk. 0 da. 0 hr. 0 min.
<u>14 " 11 " 3 " 0 " 14 " 58 "</u>
6 yr. 0 mo. 0 wk. 6 da. 9 hr. 2 min. <i>Ans.</i>

(48)

7304010
<u>950140</u>
6353870

(49)	(50)
21427	7530
15680	1510
<u>5747</u> Ans.	<u>6020</u> Ans.

(52)
46500
10310
<u>36190</u> Ans.

(51)	}
4537046.16	
7203048.52	
826437.99	
<u>12576532.67</u>	
38289341.58	
12576532.67	
<u>Ans. 25712808.91</u>	

(53)	(54)
683021	124336054
902563	16891020
<u>1585584</u> = min.	<u>107445034</u> Ans.
1585584	
<u>902563</u>	
<u>683021</u> Ans.	

(55)
10000
3726
<u>6274</u> Ans.

(56)
9 T. 0 cwt. 3 qr. 20 lb.
4 " 17 " 0 " 22 "
<u>4 T. 3 cwt. 2 qr. 23 lb.</u> Ans.

(57)	(58)
£25 0s. 0d. 0 far.	3100 mi. 0 fur. 0 rd.
5 0s. 9d. 1 "	800 " 5 " 36 "
<u>£19 19s. 2d. 3 far.</u> Ans.	<u>2299 mi. 2 fur. 4 rd.</u> Ans.

(59)	(60)	(61)
3500.500	925.875	1.875 20.00
3300.875	750.000	2.500 16.75
<u>199.625</u> Ans.	<u>\$175.875</u> Ans.	<u>12.375</u> \$3.25
		16.750

(62)	(63)	
23191876	50922	2988892
3204313	31324	89644
<u>19987563</u> Ans.	<u>7398</u>	<u>2899248</u> Ans.
	89644	

(64)	(65)	(66)	
30000	139190	475.125	1500.000
25250	116375	300.000	1301.375
<u>25250</u>	<u>22815</u>	<u>526.25</u>	<u>198.625</u>
73675 Ans.		1301.375	
25250			
<u>20575</u>			
126325			

(67)					(68)
1857 yr.	3 mo.	4 da.	15 hr.	30 min.	1576.000
1776 "	7 "	4 "	12 "	0 "	<u>920.875</u>
80 yr.	8 mo.	0 da.	3 hr.	30 min.	655.125
Ans.					

(69)	(70)	(71)
1856 yr.	36804	61337574
1607 "	18927	54026818
<u>249 yr.</u>	<u>17877</u> Ans.	<u>7310756</u>
1 mo.		
11 da.		
Ans.		

(72)	(73)	(74)
19 cwt.	50376	6375
1 qr.	42978	4015
15 lb.	<u>7398</u> Ans.	<u>2360</u> Ans.
14 "		
3 "		
22 "		
<u>4 cwt.</u>		
1 qr.		
18 lb.		
Ans.		

(75)	(76)
1856	12103
1330	5829
<u>526</u> Ans.	<u>6274</u> Ans.

(77)

2084.500	2375.600	5037.975
760.875	912.375	4681.625
1836.25	1750.000	\$356.350 gain.
\$4681.625 paid.	\$5037.975 received.	

(78)

9 A. 3 R. 32 P.	10 A. 2 R. 0 P
12 " 0 " 29 "	15 " 1 " 20 "
22 A. 0 R. 21 P.	25 A. 3 R. 20 P
	22 " 0 " 21 "
	3 A. 2 R. 39 P Ans.

(79)

48 ÷ 16 = 3 cd. ft.	20 cords 3 cd. ft.	76 cords 6 cd. ft.
80 ÷ 16 = 5 cd. ft.	14 " 6 "	35 " 1 "
	35 cords 1 cd. ft.	Ans. 41 cords 1 cd. ft.

(80)

9436.00	5260.000
475.50	1275.375
840.40	936.42
10751.90	7471.795

(81)

47568.487
3406.500
\$44161.987 Ans.

$$\$10751.90 - \$7471.795 = \$3280.105 \text{ Ans.}$$

(82)

1856 yr. 3 mo. 20 da.
1853 " 7 " 1 "
2 yr. 8 mo. 19 da.

(83)

5647.50	50000.00
15000.00	35647.50
15000.00	\$14352.50 Ans.
35647.50	

(84)			(85)	(86)	
63 gal.	0 qt.	0 pt.	80025	1500	25000
32 "	1 "	1 "	29963	4700	9450
30 gal.	2 qt.	1 pt.	50062	2500	15550 <i>Ans.</i>
				750	
				9450	

(87)			(88)	(89)
42°	21'	23"	300.000	20936468
29°	57'	30"	410.500	18664761
12°	23'	53"	50.675	2271707
			761.175	
			761.175	
			600.000	
			\$161.175 loss. <i>Ans.</i>	
				(90)
				47 yd. 0 qr. 0 na.
				14 " 3 " 2 "
				32 yd. 0 qr. 2 na.

(91)		
£105 19s. 11d. 0 far.	£50 0s. 0d.	£1470 3s. 1d.
127 10s. 9d. 2 "	350 14s. 9d.	520 0s. 5d.
34 18s. 10d. 0 "	24 11s. 0d.	
500 19s. 0d. 0 "	94 14s. 8d.	£950 2s. 8d. <i>A.</i>
700 14s. 6d. 2 "	£520 0s. 5d.	
£1470 3s. 1d. 0 far.		

## MULTIPLICATION.

(17)	(18)
<i>Ans.</i> 2479 × 25 = \$61975	15 × 24 × 9 = 3240 miles.

(19)
125 × 26 = \$3250 ; 96 × 32 = \$3072 ; 3250 + 3072 = \$6322 ; 2500 + 1725 = \$4225 ; 6322 - 4225 = \$2097. <i>Ans.</i>



(20)	(21)	
14 yd. 3 qr. 2 na.	5s. 3d. 2 far.	
9	15	
133 yd. 3 qr. 2 na.	£3 19s. 4d. 2 far.	<i>Ans.</i>

(22)

$$\$2.48 \times 416 = \$1031.68 \text{ Ans.}$$

(23)

$$\$8.75 \times 40 = \$350 ; \$9.125 \times 40 = \$365 ; \$365 - 350 = \$15 \text{ A.}$$

(24)

$$7 \text{ cwt. } 2 \text{ qr. } 18 \text{ lb.} = 768 \text{ lb.} ; 768 \times 11 = 8448 \text{ lb.} ;$$

$$8448 \times .06 = \$506.88 \text{ Ans.}$$

(25)

$$44 \times 36 \times 4 = \$6336 \text{ Ans.}$$

(26)

$$600 + 570 + 1200 = \$2370 ; 3479 - 2370 = \$1109 ;$$

$$1109 \times 5 = \$5545 \text{ Ans.}$$

(27)

$$931324 \times 18 = \$16763832 \text{ Ans.}$$

(28)	(29)	
20 mi. 5 fur. 16 rd.	365 \times 30 \times .06 = \\$657	<i>Ans.</i>
3		
62      0      8		
8		
496 mi. 1 fur. 24 rd.		<i>Ans.</i>

(30)

$$118 \times .62\frac{1}{2} = \$73.75$$

$$9.875 \times 5 = \underline{49.375}$$

$$\$24.375 \text{ Ans.}$$

(31)

$$(34+28) \times 14 = 868 \text{ miles. } Ans.$$

(32)

$$10 \overline{3} \ 6 \ 3 \ 2 \ 0 \ 14 \text{ gr.}$$

(33)

$$\begin{array}{r} 2 \text{ bu.} \ 3 \text{ pk.} \ 6 \text{ qt.} \\ \hline 20 \end{array}$$

$$\begin{array}{r} 58 \text{ bu.} \ 3 \text{ pk.} \ 0 \text{ qt.} \\ \hline 7 \end{array}$$

$$411 \text{ bu.} \ 1 \text{ pk.} \ 0 \text{ qt. } Ans.$$

$$\begin{array}{r} 7 \overline{1} \ 2 \ 3 \ 7 \ 3 \ 0 \ 0 \ 12 \text{ gr.} \end{array}$$

(34)

$$2018 \times 212 = 427816 \text{ bbl. } A.$$

(35)

$$7 \text{ cwt.} \ 2 \text{ qr.} \ 16 \text{ lb.} = 766 \text{ lb.}; 766 \times .11 = \$84.26 \text{ } Ans.$$

(36)

$$984 \times 245 \times .07 = \$16875.60 \text{ } Ans.$$

(37)

	18 cwt.	3 qr.	21 lb.
			6
5	13	3	1
2	15	1	5
2 T.	18 cwt.	1 qr.	21 lb. <i>Ans.</i>

(38)

$$136 \times 17 = 2312 \text{ bu.}; 2312 \times .42 = \$971.04 \text{ } Ans.$$

(39)

$$1845 \times 7 = \$12915; 528 \times 9 = \$4752;$$

$$856 \times 8 = \$6848; 4752 + 6848 = \$11600;$$

$$528 \times 856 = 1384; 1845 - 1384 = 461 \text{ bbl., left};$$

$$12915 - 11600 = \$1315, \text{ value of } 461 \text{ bbl.}$$

(40)

$$872 \times 25 \times .06\frac{1}{2} = \$1417 \text{ } Ans.$$

(41)

$$52770231 \times \$1.25 = \$65962788.75 \text{ Ans.}$$

(42)

$$25 \times 30 = 750 \text{ days. Ans.}$$

(43)

$$2700 \times 5 = \$13500 \text{ Ans.}$$

(44)

$$72 \times 9 \times .37\frac{1}{2} = \$243 \text{ Ans.}$$

(45)

$$46 \times 37 \times 7 = \$11914 \text{ Ans.}$$

(46)

$$\$37.565 \times 127 = \$4770.755 \text{ Ans.}$$

(47)

$$127 \times 39 = \$4953 ; 43 \times 86 = \$3698 ;$$

$$127 - 86 = 41 \text{ cattle left ; } 4953 - 3698 = 1255 ;$$

$$1255 + 1246 = 2501 ; 2501 \div 41 = \$61 \text{ Ans.}$$

(48)

$$16 \times 56 \times 75 = \$672 \text{ Ans.}$$

(49)

$$1856 \text{ yr. } 9 \text{ mo. } 4 \text{ da.}$$

$$1850 \text{ " } 4 \text{ " } 20 \text{ "}$$

$$\hline 6 \text{ yr. } 4 \text{ mo. } 14 \text{ da.}$$

5

$$\hline 31 \text{ yr. } 10 \text{ mo. } 10 \text{ da.}$$

9

$$\hline 286 \text{ yr. } 9 \text{ mo. } 0 \text{ da. Ans.}$$

(50)

$$16 \text{ ft. } 8 \text{ in. } \times 84 = 84 \text{ rd. } 14 \text{ ft. } A.$$

(51)

$$8 \times 2 + 50 = 66 ; 58 \times 2 = 116 ;$$

$$116 - 66 = 50 \text{ Ans.}$$

(52)

$$5 \text{ cords } 6 \text{ cord feet } 32 \text{ cu. ft. } \times 4 = 24 \text{ cords. Ans.}$$

(53)

$$56 \times 25 = \$1400 ; 94 \times 32 = \$3008 ; 1400 + 3008 = 4408 ;$$

$$(56 + 94) \times 30 = \$4500 ; 4500 - 4408 = \$92, \text{ gain. } \textit{Ans.}$$

(54)

$$12 \times 9 \times 2 = 216 \text{ men. } \textit{Ans.}$$

(55)

$$25.50 \times 4 = 102$$

$$2.125 \times 12 = 25.50$$

$$7.25 \times 3 = 21.75$$

(56)

$$326 \times 116 = 37816 \text{ tons. } \textit{Ans.}$$

$$\underline{\$149.25} \text{ } \textit{Ans.}$$

(57)

$$960 \times .09 = 86.40 ; \$4.75 \times 12 = \$57 ; \$104.90 - 70.02 = \$34.88 ;$$

$$148 \times .12\frac{1}{2} = 18.50 ; 186 \times .07 = \$13.02$$

$$\underline{\$104.90}$$

$$\underline{\$70.02}$$

(58)

$$1 \text{ gal. } 2 \text{ qt. } 1 \text{ pt. } 2 \text{ gi.} = 54 \text{ gi. ;}$$

$$54 \text{ gi.} \times 25000 = 1350000 \text{ gi.} = 669 \text{ hhd. } 40 \text{ gal. } 2 \text{ qt. } \textit{Ans.}$$

(59)

$$100 + 95 = 195 ; 195 \times 70000 = \$13650000.$$

(60)

$$39 \times 27 = \$1053 ; 70 = 27 \times .45 = \$850.50 ;$$

$$1053 - 850.50 = 202.50 \text{ } \textit{Ans.}$$

(61)

14 pounds of tea,	at 75 cents,	.	.	.	\$10.50
9 " " coffee,	14 "	.	.	.	1.26
42 " " sugar,	11 "	.	.	.	4.62
3 " " pepper,	12 $\frac{1}{2}$ "	.	.	.	.375
5 " " chocolate,	56 "	.	.	.	2.80
12 " " candles,	16 "	.	.	.	1.92
Amount, . . .					<u>\$21.475</u>

( 62 )

48 pounds of sugar at $9\frac{1}{2}$ cents a pound, . . .	\$4.56
6 hogsheads of molasses, each containing 63 gal- lons, at 27 cents a gallon, . . .	102.06
8 casks of rice, 285 lb. each, at 5 cents a pound,	114.00
9 chests of tea, 86 lb. each, at $87\frac{1}{2}$ cents a pound,	677.25
4 bags of coffee, each 67 lb., at 11 cents a pound,	29.44
Amount,	<u>\$927.35</u>

( 63 )

78 chests of tea, at \$55.65 per chest, . . .	\$4840.70
251 bags of coffee, 100 lb. each, at $12\frac{1}{2}$ cents per pound, . . .	3137.50
317 boxes of raisins, at \$2.75 per box, . . .	871.75
1049 barrels of shad, at \$7.50 per barrel, . . .	7867.50
76 barrels of oil, 32 gallons each, at \$1.08 per gallon, . . .	2626.56
Amount,	<u>\$18844.01</u>

( 64 )

10 yards of broadcloth, at \$4.37 $\frac{1}{2}$ , . . .	\$43.75
75 " " sheeting, at .09 . . .	6.75
42 " " plaid prints, at .45, . . .	18.90
5 barrels of Genesee flour, at \$7.87 $\frac{1}{2}$ , . . .	39.375
7 pairs of boots, at \$1.60 per pair, . . .	11.20
18 bushels of corn, at 72 cents per bushel, . . .	12.96
Amount,	<u>\$132.935</u>

( 65 )

	£	s.	d.
45 yards of broadcloth, at 9s. 6d., . . .	21	7	6
56 " " at 12s. 9 $\frac{1}{4}$ d., . . .	35	15	2
16 " vestings, at 6s. 8 $\frac{1}{2}$ d., . . .	5	7	4
24 lb. colored thread, at 5s. 4d., . . .	6	8	0
72 pairs silk hose, at 7s. 5 $\frac{1}{2}$ d., . . .	26	18	6
108 yards carpeting, at 14s. 10d., . . .	80	2	0
Amount,	<u>£175</u>	<u>18</u>	<u>6</u>

## DIVISION.

(44)

41)729 A. 2 R. 7 P. (17 A. 3 R. 7 P. *Ans.*)

$$\begin{array}{r}
 41 \\
 \hline
 319 \\
 287 \\
 \hline
 32 \\
 4 \\
 \hline
 130 \\
 123 \\
 \hline
 7 \\
 40 \\
 \hline
 287 \\
 287 \\
 \hline
 \dots
 \end{array}$$

(45)  
240)365 da. 6 hr. (1 da. 12 hr. 31 min. 30 sec. *Ans.*)

$$\begin{array}{r}
 240 \\
 \hline
 125 \\
 24 \\
 \hline
 3006 \\
 240 \\
 \hline
 606 \\
 480 \\
 \hline
 126 \\
 60 \\
 \hline
 7560 \\
 720 \\
 \hline
 360 \\
 240 \\
 \hline
 120 \\
 60 \\
 \hline
 7200 \\
 720 \\
 \hline
 \dots
 \end{array}$$

(49)

\$18306.25 ÷ 725 = \$25.25 *Ans.*

(50)

16s. 4d. ÷ 7 = 2s. 4d. *Ans.*

(51)

265 mi. 6 fur. 16 rd. ÷ 12 =  
22 mi. 1 fur. 8 rd. *Ans.*

(52)

569 A. 2 R. 23 P. ÷ 9 =  
63 A. 1 R. 7 P.  
63 A. 1 R. 7 P. × 5 =  
316 A. 1 R. 35 P. *Ans.*

(53)

\$10000 ÷ 365 = \$27.397. *Ans.*

(54)

987551235 ÷ 9999 = 98765 *Ans.*

(55)

\$75000 ÷ 4 = \$18750; 75000 - 18750 = \$56250;  
56250 ÷ 5 = \$11250 *Ans.*

(56)

$$\$54026818 \div 365 = \$148018\frac{18}{365} \text{ Ans.}$$

(57)

$$\$133.00 \div 28 = \$4.75 \text{ Ans.}$$

(58)

$$\$637.50 \div 51 = \$12.50 \text{ Ans.}$$

(59)

$$78747600 \div 104 = 757188\frac{18}{104} \text{ Ans.}$$

(60)

$$\$30.875 \div 19 = \$1.625 \text{ Ans.}$$

(61)

$$5 \times 5 = 25 \text{ loaves per day ;}$$

$$9125 \div 25 = 365 \text{ days. Ans.}$$

(62)

$$7207272072 \div 9009 = 800008 \text{ Ans.}$$

(63)

$$10 \text{ oz. } 11 \text{ pwt. } 12 \text{ gr.} \div 4 \text{ pwt. } 12 \text{ gr.} = 5076 \text{ gr.} \div 108 \text{ gr.} =$$

$$47 \text{ rings. Ans.}$$

(64)

$$\$67.50 = 6750 \text{ cents ; } 6750 \div 2 = 3375 \text{ lb.} = 1 \text{ T. } 13 \text{ cwt. } 3 \text{ qr.}$$

(65)

$$12 \text{ T. } 38 \text{ ft. } 118 \text{ in.} \div 14 = 45 \text{ cu. ft. } 995\frac{12}{14} \text{ cu. in. Ans.}$$

(66)

$$285702 \div 9285 = 30\frac{7152}{9285} \text{ Ans.}$$

(67)

$$942321 \div 213 = 4424\frac{9}{213} \text{ Ans.}$$

(68)

$$360^{\circ} 0' 0'' \div 365 = 59' 10' \frac{2}{3} \text{ } \textit{Ans.}$$

(69)

$$3 \text{ lb. } 11 \text{ oz. } \div 15 \text{ pwt. } 16 \text{ gr.} = 22560 \text{ gr. } \div 376 \text{ gr.} = 60 = 5 \text{ doz.}$$

(70)

$$\$3.25 \times 48 = \$156; 156 + 60 = 216; 216.00 \div 48 = \$4.50 \text{ } \textit{A.}$$

(71)

$$£75 \text{ } 18\text{s. } 9\text{d.} \div 5 = £15 \text{ } 3\text{s. } 9\text{d.}; £15 \text{ } 3\text{s. } 9\text{d.} \times 18 = £273 \text{ } 7\text{s. } 6\text{d.}$$

(72)

$$75 \text{ mi.} = 4752000 \text{ in.}; 9 \text{ ft. } 6 \text{ in.} = 114 \text{ in.};$$

$$4752000 \div 114 = 41684 \frac{24}{114} \text{ } \textit{Ans.}$$

(73)

$$18 - 6 = 12, \text{ product}; 12 \div 4 = 3, \text{ quotient}; 3 \times 3 = 9 \text{ } \textit{Ans.}$$

(74)

$$\$28672 \div 512 = \$56 \text{ } \textit{Ans.}$$

(75)

$$288120 \div 432 = 666 \frac{408}{432} \text{ } \textit{Ans.}$$

(76)

$$96000000 \div 8 = 12000000; 12000000 \div 60 = 200000 \text{ } \textit{Ans.}$$

## CONTRACTIONS IN MULTIPLICATION.

(1)

$$287 \times 25 = 28700 \div 4 = 7175 \text{ } \textit{Ans.}$$

(2)

$$184 \times 25 = 18400 \div 4 = 4600 \text{ } \textit{Ans.}$$



(3)

$$6741 \times 25 = 674100 \div 4 = 168525 \text{ Ans.}$$

(4)

$$3074 \times 25 = 307400 \div 4 = 76850 \text{ Ans.}$$

(1)

$$\begin{array}{r} 327 \\ 8\frac{1}{2} \\ \hline 109 \\ 2616 \\ \hline 2725 \text{ Ans.} \end{array}$$

(2)

$$\begin{array}{r} 23474 \\ 16\frac{1}{2} \\ \hline 11737 \\ 140844 \\ 23474 \\ \hline 387321 \text{ Ans.} \end{array}$$

(3)

$$\begin{array}{r} 34700 \\ 127\frac{1}{2} \\ \hline 6940 \\ 242900 \\ 69400 \\ 34700 \\ \hline 4413840 \text{ Ans.} \end{array}$$

(4)

$$\begin{array}{r} 1272 \\ 12\frac{1}{2} \\ \hline 159 \\ 15264 \\ \hline 15423 \end{array}$$

(5)

$$\begin{array}{r} 9824 \\ 272\frac{1}{4} \\ \hline 2456 \\ 19648 \\ 68768 \\ 19648 \\ \hline 2674584 \text{ Ans.} \end{array}$$

(6)

$$\begin{array}{r} 3828 \\ 73\frac{1}{8} \\ \hline 638 \\ 11484 \\ 26796 \\ \hline 280082 \text{ Ans.} \end{array}$$

(1)

$$384 \times 12\frac{1}{2} = 38400 \div 8 = 4800 \text{ Ans.}$$

(2)

$$476 \times 12\frac{1}{2} = 47600 \div 8 = 5950 \text{ Ans.}$$

(3)

$$14800 \times 12\frac{1}{2} = 1480000 \div 8 = 185000 \text{ Ans.}$$

(4)

$$670418 \times 12\frac{1}{2} = 67041800 \div 8 = 8380225 \text{ Ans.}$$

(1)

$$1679252 \times 33\frac{1}{3} = 167925200 \div 3 = 55975066\frac{2}{3} \text{ Ans.}$$

(2)

$$1480724 \times 33\frac{1}{3} = 148072400 \div 3 = 49357466\frac{2}{3} \text{ Ans.}$$

(3)

$$10675512 \times 33\frac{1}{3} = 1067551200 \div 3 = 355850400 \text{ Ans.}$$

(4)

$$4442172 \times 333\frac{1}{3} = 4442172000 \div 3 = 1480724000 \text{ Ans.}$$

(1)

$$59264 \times 125 = 59264000 \div 8 = 7408000 \text{ Ans.}$$

(2)

$$17593408 \times 125 = 17593408000 \div 8 = 2199176000 \text{ Ans.}$$

(3)

$$1940812 \times 125 = 1940812000 \div 8 = 242601500 \text{ Ans.}$$

(4)

$$140588 \times 125 = 140588000 \div 8 = 17573500 \text{ Ans.}$$

(1)

$$284 \times 50 \text{ cents} = 284 \div 2 = \$142 \text{ Ans.}$$

(2)

$$51 \times 33\frac{1}{3} = 51.00 \div 3 = \$17.00 \text{ Ans.}$$

(3)

$$112 \times .12\frac{1}{2} = 112.00 \div 8 = \$14. \text{ Ans.}$$

(4)

$$175 \times .20 = 175.00 \div 5 = \$35.00 \text{ Ans.}$$

(5)

$$576 \times 1.50 = 576 \times 1\frac{1}{2} = \$864 \text{ Ans.}$$

(6)

$$129 \times 1.33\frac{1}{3} = 129 \times 1\frac{1}{3} = \$172 \text{ Ans.}$$

(7)

$$96 \times 1.25 = 96 \times 1\frac{1}{4} = \$120 \text{ Ans.}$$

(8)

$$25 \times 1.20 \times 3 = 25 \times 1\frac{1}{5} \times 3 = \$90 \text{ Ans.}$$

(1)

$$3742 \times 3.25 \div 100 = \$121.615 \text{ Ans.}$$

(2)

$$5400 \times 12.50 \div 1000 = \$67.50 \text{ Ans.}$$

(3)

$$7568 \times \$9.75 \div 100 = \$737.88 \text{ Ans.}$$

(4)

$$19875 \times 25 \div 1000 = \$496.875 \text{ Ans.}$$

(5)

$$1275 \times 9 \div 1000 = \$11.475$$

$$3720 \times 15.25 \div 1000 = 56.730$$

$$715 \times 8.75 \div 1000 = 6.25625$$

$$1200 \times 12.06 \div 1000 = 14.472$$

$$2550 \times .75 \div 100 = 19.125$$

$$965 \times 1.12\frac{1}{2} \div 100 = 10.85625$$

$$\$118.91450 \text{ Ans.}$$

(1)

$$\$3.84 \div 2 = 1.92; 1575 \times 1.92 \div 1000 = \$3.024 \text{ Ans.}$$

(2)

$$7.37\frac{1}{2} \div 2 = 3.6875; 3496 \times 3.6875 \div 1000 = \$12.8915 \text{ Ans.}$$

(3)

$$9.40 \div 2 = 4.70; 10.25 \div 2 = 5.125; 14.60 \div 2 = 7.30.$$

$$1260 \times 4.70 \div 1000 = \$5.922; 1260 \times 5.125 \div 1000 = \$6.4575;$$

$$1260 \times 7.30 \div 1000 = \$9.198 \text{ Ans.}$$

(4)

$$6.65 \div 2 = 3.325; 5482 \times 3.325 \div 1000 = \$18.22765 \text{ Ans.}$$

(5)

$$1.87\frac{1}{2} \div 2 = .9375; 785797 \times .9375 \div 1000 = \$736.6846875.$$

(6)

$$26 \div 2 = 13; 67418 \times 13 \div 1000 = \$876.434 \text{ Ans.}$$

(7)

$$9.75 \div 2 = 4.875; 497046 \times 4.875 \div 1000 = \$2423.09925$$

(8)

$$75 \div 2 = 37\frac{1}{2}; 9047641 \times 37\frac{1}{2} \div 1000 = \$339286.5375$$

## CONTRACTIONS IN DIVISION.

(1)

$$6350 \times 4 \div 100 = 254 \text{ Ans.}$$

(2)

$$656280 \times 4 \div 100 = 26251\frac{20}{100}$$

(3)

$$7278675 \times 4 \div 100 = 291147 \text{ Ans.}$$

(4)

$$5287215 \times 4 \div 100 = 211488 \frac{80}{100} \text{ Ans.}$$

(5)

$$12225 \times 8 \div 100 = 978 \text{ Ans.}$$

(6)

$$11925 \times 8 \div 100 = 954$$

(7)

$$1760600 \times 8 \div 100 = 140848 \text{ Ans.}$$

(8)

$$67500 \times 3 \div 100 = 2025$$

(9)

$$1308400 \times 3 \div 100 = 39252 \text{ Ans.}$$

(10)

$$15851400 \times 3 \div 100 = 475542 \text{ Ans.}$$

(11)

$$8072400 \times 3 \div 100 = 242172 \text{ Ans.}$$

(12)

$$16144800 \times 3 \div 100 = 484344 \text{ Ans.}$$

(13)

$$31702800 \times 3 \div 100 = 951084 \text{ Ans.}$$

(14)

$$281250 \times 8 \div 1000 = 2250 \text{ Ans.}$$

(15)

$$6015750 \times 8 \div 1000 = 48126 \text{ Ans.}$$

(16)

$$2026875 \times 8 \div 1000 = 16215 \text{ Ans.}$$

(17)

$$6080625 \times 8 \div 1000 = 48645 \text{ Ans.}$$

$$(18) \\ 18047250 \times 8 \div 1000 = 144378.$$

$$(1) \\ \begin{array}{r} 2 \overline{)2322} \div 6 \\ 3 \overline{)1161} \\ \hline 387 \text{ Ans.} \end{array}$$

$$(2) \\ \begin{array}{r} 4 \overline{)37152} \div 24 \\ 6 \overline{)9288} \\ \hline 1548 \text{ Ans.} \end{array}$$

$$(3) \\ \begin{array}{r} 6 \overline{)19152} \div 36 \\ 6 \overline{)3192} \\ \hline 532 \text{ Ans.} \end{array}$$

$$(4) \\ \begin{array}{r} 4 \overline{)38592} \div 48 \\ 12 \overline{)9648} \\ \hline 804 \text{ Ans.} \end{array}$$

$$(5) \\ \begin{array}{r} 8 \overline{)1145592} \div 72 \\ 9 \overline{)143199} \\ \hline 15911 \text{ Ans.} \end{array}$$

$$(6) \\ \begin{array}{r} 8 \overline{)185760} \div 96 \\ 12 \overline{)23220} \\ \hline 1935 \text{ Ans.} \end{array}$$

$$(7) \\ \begin{array}{r} 8 \overline{)115776} \div 64 \\ 8 \overline{)14472} \\ \hline 1809 \text{ Ans.} \end{array}$$

$$(8) \\ \begin{array}{r} 12 \overline{)463104} \div 144 \\ 12 \overline{)38592} \\ \hline 3216 \text{ Ans.} \end{array}$$

$$(1) \\ \begin{array}{r} 7 \overline{)416705} \div 315 \\ 9 \overline{)59529} \dots 2 \dots \dots \dots 2 \\ 5 \overline{)6614} \dots 3 \dots \dots \dots 3 \times 7 = 21 \\ 1322 \dots 4 \dots \dots \dots 4 \times 9 \times 7 = 252 \\ \text{True remainder,} \quad 275 \end{array}$$

$$(2) \\ \begin{array}{r} 3 \overline{)804106} \div 462 \\ 2 \overline{)268035} \dots 1 \dots \dots \dots 1 \\ 7 \overline{)134017} \dots 1 \dots \dots \dots 1 \times 3 = 3 \\ 11 \overline{)19145} \dots 2 \dots \dots \dots 2 \times 2 \times 3 = 12 \\ \quad 1740 \dots 5 \dots \dots \dots 5 \times 7 \times 2 \times 3 = 210 \\ \text{True remainder,} \quad 226 \end{array}$$

(3)

$$4)756807 \div 3456$$

$$8)189201 \dots 3 \dots \dots \dots 3$$

$$9)23650 \dots 1 \dots \dots 1 \times 4 = 4$$

$$12)2627 \dots 7 \dots \dots 7 \times 8 \times 4 = 224$$

$$218 \dots 11 \dots \dots 11 \times 9 \times 8 \times 4 = 3168$$

$$\text{True remainder,} \quad 3399$$

(4)

$$3)8741659 \div 105$$

$$5)2913886 \dots 1 \dots \dots \dots 1$$

$$7)582777 \dots 1 \dots \dots 1 \times 3 = 3$$

$$83253 \dots 6 \dots \dots 6 \times 5 \times 3 = 90$$

$$\text{True remainder,} \quad 94$$

(5)

$$5)947043 \div 385$$

$$7)189408 \dots 3 \dots \dots \dots 3$$

$$11)27058 \dots 2 \dots \dots 2 \times 5 = 10$$

$$2459 \dots 9 \dots \dots 9 \times 7 \times 5 = 315$$

$$\text{True remainder,} \quad 328$$

(6)

$$11)4704967 \div 1155$$

$$7)427724 \dots 3 \dots \dots \dots 3$$

$$5)61103 \dots 3 \dots \dots 3 \times 11 = 33$$

$$3)12220 \dots 3 \dots \dots 3 \times 7 \times 11 = 231$$

$$4073 \dots 1 \dots \dots 1 \times 5 \times 7 \times 11 = 385$$

$$\text{True remainder,} \quad 652$$

(7)

$$8)71874607 \div 7560$$

$$7)8984325 \dots 7 \dots \dots \dots 7$$

$$9)1283475 \dots 0$$

$$5)142608 \dots 3 \dots \dots 3 \times 7 \times 8 = 168$$

$$3)28521 \dots 3 \dots \dots 3 \times 9 \times 7 \times 8 = 1512$$

$$9507 \dots 0 \dots$$

$$\text{True remainder,} \quad 1687$$

(1)

(2)

$$42|0000)197|2654(4222654 \text{ Ans. } 12|000)1752|000(146 \text{ Ans.}$$

$$168$$

$$1752$$

$$292654$$

$$000$$

(3)

$$8014|00)731990|06(91271606 \text{ Ans.}$$

$$729274$$

$$271606$$

(4)

$$72|000(11428729|800(15873225800 \text{ Ans.}$$

$$72 \dots \dots$$

$$422$$

$$360$$

$$628$$

$$576$$

$$527$$

$$504$$

$$232$$

$$216$$

$$169$$

$$144$$

$$25800 \text{ Rem.}$$

(5)

$$146|000)36981|400(25343300$$

$$292 \dots$$

$$778$$

$$730$$

$$481$$

$$438$$

$$43400$$



$$\begin{array}{r}
 (6) \\
 63 \overline{)000} 141614 \overline{)398} (2247 \frac{3322}{88000} \text{ Ans.} \\
 \underline{141561} \\
 53398 \text{ Rem.}
 \end{array}$$

$$\begin{array}{r}
 (1) \quad 3245 \div 16 \frac{1}{2} \\
 \underline{2 \quad 2} \\
 6490 \div 33
 \end{array}
 \quad
 \begin{array}{r}
 (2) \quad 47804 \div 15 \frac{1}{3} \\
 \underline{3 \quad 3} \\
 143412 \div 46
 \end{array}
 \quad
 \begin{array}{r}
 (3) \quad 870631 \div 14 \frac{1}{4} \\
 \underline{4 \quad 4} \\
 3482524 \div 57
 \end{array}$$

$$33)6490(196 \frac{22}{33} \quad 46)143412(3117 \frac{30}{46} \quad 57)3482524(61096 \frac{52}{57}$$

$$\begin{array}{r}
 (4) \quad 37214 \div 51 \frac{1}{8} \\
 \underline{8 \quad 8} \\
 297712 \div 409
 \end{array}
 \quad
 \begin{array}{r}
 (5) \quad 87317 \div 9 \frac{3}{5} \\
 \underline{5 \quad 5} \\
 436585 \div 48
 \end{array}$$

$$409)297712(727 \frac{382}{409} \text{ Ans.} \quad 48)436585(9095 \frac{25}{48} \text{ Ans.}$$

$$(6) \quad 87906 \div 12 \frac{1}{2} = 615342 \div 88 = 6992 \frac{46}{88} \text{ Ans.}$$

$$(7) \quad 95675 \div 15 \frac{5}{8} = 861075 \div 140 = 6150 \frac{75}{140} \text{ Ans.}$$

$$(8) \quad 71096 \div 17 \frac{3}{7} = 497672 \div 122 = 4079 \frac{34}{122} \text{ Ans.}$$

## PRACTICE.

$$\begin{array}{r}
 (1) \\
 \begin{array}{l}
 2 \\
 6 \end{array} \left| \begin{array}{l}
 \frac{1}{2} \quad 425\text{s.} = \text{cost at 1s. per yard.} \\
 212\text{s. 6d.} = \text{cost at 6d. per yard.} \\
 20 \quad 637\text{s. 6d.} = \text{cost at 1s. 6d. per yard.} \\
 \hline
 \pounds 31 \text{ 17s. 6d. Ans.}
 \end{array}
 \right.
 \end{array}$$

(2)

1	$\frac{1}{4}$	475d. = cost at 1d. per yard.
		118d. 3 far. = cost at 1 far. per yard.
12		593d. 3 far. cost at 1d. 1 far. "
		20 49s. 5d.

£2 9s. 5d. 3 far. *Ans.*

(3)

$$354 \times 1\frac{1}{4} = 442\frac{1}{2}d = £1 \ 16s. \ 10\frac{1}{2} \text{ Ans.}$$

(4)

12 $\frac{1}{2}$	$\frac{1}{8}$	\$4756 = cost at \$1 per yard.
		\$594.50 " at 12 $\frac{1}{2}$ cents per yard.

(5)

2 6	$\frac{1}{8}$	£3754 = cost at £1 per pair.
		£469 5s. = cost at 2s. 6d per pair.

(6)

2s.	$\frac{1}{10}$	£5320 = cost at £1 per bushel.
1s.	$\frac{1}{4}$	532 = " 2s. "
6d.	$\frac{1}{2}$	266 = " 1s. "
		133 = " 6d. "
		£931 = " 3s. 6d. per bushel.

(7)

4s.	$\frac{1}{8}$	£435 = cost at £1.
2s.	$\frac{1}{4}$	87 = " at 4s.
1s.	$\frac{1}{2}$	43 10s. = cost at 2s.
		21 15s. = " at 1s.
		£587 5s. = " at 7s.

(8)

$$660 \times 2\frac{1}{2} = 1650s. = \text{£}82 \text{ 10s. } \textit{Ans.}$$

(9)

$$40 \times \frac{1}{4} = 10c. = \text{cost at } \frac{1}{4}c. \text{ per lb.}$$

$$10 \times 3 = 30c. = \text{ " at } \frac{3}{4}c. \text{ "}$$

$$40 \times 6 = 240c. = \text{ " at 6c. "}$$

$$240 + 30 = 270c. = \$2.70 = \text{cost at } 6\frac{3}{4} \text{ cents per lb.}$$

(10)

cta.			
50	$\frac{1}{2}$	\$148 = \text{cost at } \\$1 \text{ per yard.}	
		3	
		444 = " at \$3 "	
25	$\frac{1}{2}$	74 = " at 50 cents per yard.	
		37 = " at 25 " "	
		Ans. \$555 = " at \$3.75 "	

(11)

cta.			
50	$\frac{1}{2}$	\$876 = \text{cost at } \\$1.	
12 $\frac{1}{2}$	$\frac{1}{4}$	438 = " at 50 cents.	
		109.50 = \text{cost at } 12\frac{1}{2} \text{ cents.}	
		\$547.50 cost at 62 $\frac{1}{2}$ "	

(12)

$$1000 \div 5 = 200$$

$$200 \times 1\frac{1}{2} = 300c.$$

$$300c. = \$3 \textit{ Ans.}$$

qr.

(13)

2	$\frac{1}{2}$	\$9.50 = \text{cost of } 1 \text{ yd.}	
		85	
		4750	
		7600	
		807.50 = \text{cost of } 85 \text{ yd.}	
		4.75 = " 2 qr.	
		\$812.25 = " 85 yd. 2 qr.	

(14)

$$3.75 \times 6\frac{1}{2} = \$24.375$$

		(15)
box.		
$\frac{1}{8}$	$\frac{1}{8}$	\$7.25 = cost of 1 box.
		8
		<hr/>
		58.00 = " of 8 boxes.
$\frac{1}{4}$	$\frac{1}{4}$	3.625 = " of $\frac{1}{4}$ box.
		1.8125 = " of $\frac{1}{4}$ box.
		<hr/>
		\$63.4375 = " of $8\frac{3}{4}$ boxes. <i>Ans.</i>

(16)

$$20.75 \times 15\frac{1}{2} = \$315.40 \text{ } Ans.$$

		(17)
		124 = cost of 1 ton.
		3
		<hr/>
15 cwt.	$\frac{1}{4}$	372 = " of 3 tons.
2 qr.	$\frac{1}{10}$	93 = " of 15 cwt.
10 lb.	$\frac{1}{5}$	3.10 = " of 2 qr.
5 lb.	$\frac{1}{2}$	.62 = " of 10 lb.
		.31 = " of 5 lb.
		<hr/>
		\$469.03 = " of 3 T. 15 cwt. 2 qr. 15 lb.

(18)

$$3s. 6d. = 3\frac{1}{2}s.; \quad 350 \times 3\frac{1}{2} = 1225s. = \text{£}61 \text{ } 5s. \text{ } Ans.$$

## LONGITUDE AND TIME.

(3)

$$\begin{array}{r} 42 \text{ min. } 16 \text{ sec. time.} \\ 15 \\ \hline 1^{\circ} 34' 0'' \text{ long. } Ans. \end{array}$$

(4)

$$\begin{array}{r} 2 \text{ hr. } 20 \text{ min. } 44 \text{ sec. time.} \\ 15 \\ \hline 35^{\circ} 11' 0'' \text{ long. } Ans. \end{array}$$

$$\begin{array}{r}
 (5) \\
 \begin{array}{r}
 12 \text{ hr. } 0 \text{ min. } 0 \text{ sec.} \\
 11 \text{ " } 6 \text{ " } 28 \text{ " } \\
 \hline
 \text{Dif. time} \quad 53 \text{ min. } 32 \text{ sec.} \\
 \quad \quad \quad 15 \\
 \hline
 13^{\circ} 23' 0'' \text{ long. } \textit{Ans.}
 \end{array}
 \end{array}$$

$$\begin{array}{l}
 (1) \\
 89^{\circ} 33' - 74^{\circ} 1' = 15^{\circ} 32' = \text{diff. long.}; \\
 15^{\circ} 32' \div 15 = 1 \text{ hr. } 2 \text{ min. } 8 \text{ sec. time}; \\
 12 \text{ hr.} + 1 \text{ hr. } 2 \text{ min. } 8 \text{ sec.} = 13 \text{ hr. } 2 \text{ min. } 8 \text{ sec.}; \text{ or,} \\
 2 \text{ min. } 8 \text{ sec. past 1 P. M. } \textit{Ans.}
 \end{array}$$

$$\begin{array}{l}
 (2) \\
 75^{\circ} 10' - 74^{\circ} 1' = 1^{\circ} 9' \text{ diff. long.}; \\
 1^{\circ} 9' \div 15 = 4 \text{ min. } 36 \text{ sec. time}; \\
 3 \text{ hr. } 0 \text{ min. } 0 \text{ sec.} - 4 \text{ min. } 36 \text{ sec.} = 2 \text{ hr } 55 \text{ min. } 24 \text{ sec. P. M.}
 \end{array}$$

$$\begin{array}{l}
 (3) \\
 89^{\circ} 2' - 77^{\circ} 2' = 12^{\circ} \text{ diff. long.}; 12^{\circ} \div 15 = 48 \text{ min. time.} \\
 9 \text{ hr. } 0 \text{ min.} - 48 \text{ min.} = 8 \text{ hr. } 12 \text{ min. A. M. } \textit{Ans.}
 \end{array}$$

$$\begin{array}{l}
 (4) \\
 15^{\circ} 35' \div 15 = 1 \text{ hr. } 2 \text{ min. } 20 \text{ sec. diff. time, too fast. } \textit{Ans.}
 \end{array}$$

$$\begin{array}{l}
 (1) \\
 2 \text{ hr. } 15 \text{ min. P. M.} = 14 \text{ hr. } 15 \text{ min. from midnight}; \\
 14 \text{ hr } 15 \text{ min.} - 11 \text{ hr. } 30 \text{ min.} = 2 \text{ hr. } 45 \text{ min. diff. time}; \\
 2 \text{ hr. } 45 \text{ min.} \times 15 = 41^{\circ} 15 \text{ min. longitude}; \\
 75^{\circ} 10' - 41^{\circ} 15' = 33^{\circ} 55' \text{ West. } \textit{Ans.}
 \end{array}$$

$$\begin{array}{l}
 (2) \\
 10 \text{ hr. } 40 \text{ min.} - 22 \text{ min. } 12 \text{ sec.} = 10 \text{ hr. } 17 \text{ min. } 48 \text{ sec. P. M., time} \\
 \text{of observation}; 22 \text{ min. } 12 \text{ sec.} \times 15 = 5^{\circ} 33' \text{ diff. long.}; \\
 90^{\circ} 15' + 5^{\circ} 33' = 95^{\circ} 48' \text{ West. } \textit{Ans.}
 \end{array}$$

(3)

10 hr. 30 min. - 9 hr. 0 min. = 1 hr. 30 min. diff. time ;

1 hr. 30 min.  $\times 15 = 22^\circ 30'$  ; $1^\circ 15' 22'' + 22^\circ 30' = 23^\circ 45' 22''$  West. *Ans.*

(4)

8 hr.  $\times 15 = 120^\circ$  diff. long ;  $0 + 120^\circ = 120^\circ$  West. *Ans.*

(5)

23 hr. 18 min. 15 sec. - 12 hr. 50 min. 19 sec. = 10 hr. 27 min.

56 sec. diff. time ; 10 hr. 27 min. 56 sec.  $\times 15 = 156^\circ 59'$  diff.long. ; or  $156^\circ 59'$  East. *Ans.*

## APPLICATIONS IN THE FUNDAMENTAL RULES.

(1)

 $96 \times 1.33\frac{1}{3} = \$128$  *Ans.*

(2)

 $1066 \text{ bu. } 2 \text{ pk.} \div 474 = 2 \text{ bu. } 1 \text{ pk.}$ 

(3)

 $36.00 \div .45 = 80 \text{ bu.} ; 80 \div 2\frac{1}{2} = 160 \div 5 = 32 \text{ bbl.}$ 

(4)

 $1236 \times 375 + 184 = 463684.$  *Ans.*

(5)

 $60000000 \div 24 \div 60 = 41666\frac{2}{3}$  *Ans.*

(6)

 $23191876 \div 400 = 57979\frac{276}{400}$  *Ans.*

(7)

2 mo. 3 wk. 6 da.  $\times 25 = 74 \text{ mo. } 0 \text{ wk. } 3 \text{ da.}$  = time it will  
last 1 man ;  $74 \text{ mo. } 0 \text{ wk. } 3 \text{ da.} \div 10 = 7 \text{ mo. } 1 \text{ wk. } 4\frac{1}{2} \text{ da.}$

( 8 )

$$1200 - 640 = \$560 = \text{amount saved ; } 6720 \div 560 = 12 \text{ yr. } \textit{Ans.}$$

( 9 )

$$20000000 \div 80 = 250000 \text{ min.} = 6 \text{ mo. } 0 \text{ wk. } 5 \text{ da. } 14 \text{ hr. } 40 \text{ min.}$$

( 10 )

$$47400 \div 3160 = \$15, \text{ price per bbl. ; } 11475 \div 15 = 765 \text{ bbl. } \textit{Ans.}$$

( 11 )

$$96 \times 6 \times .12\frac{1}{2} = \$72 \textit{ Ans.}$$

( 12 )

$$1000 \times \frac{1}{2} \text{ cent} = 1000 \div 2 = \$5.00 \textit{ Ans.}$$

( 13 )

$$\$9\frac{1}{2} = \$9.50 ; 9.50 \times 85\frac{1}{2} = \$812.25 \textit{ Ans.}$$

( 14 )

$$1 \text{ hhd. } 2 \text{ gal. } 3 \text{ qt.} = 263 \text{ qt. ; } 263 \times .56\frac{1}{4} = \$147.9375 \textit{ Ans.}$$

( 15 )

$$196 \times 1\frac{1}{2} = 294\text{s.} = £14 \text{ 14s. } \textit{Ans.}$$

( 16 )

$$2\text{s. } 8\text{d.} = 32\text{d. ; } 1246 \times 32 = 39872\text{d.} = £166 \text{ 2s. } 8\text{d. } \textit{Ans.}$$

( 17 )

$$£2 \text{ 16s.} = 56\text{s. ; } 56\text{s.} \div 112 = 672\text{d.} \div 112 = 6\text{d. } \textit{Ans.}$$

( 18 )

$$\$9.75 \div 2 = \$4.87\frac{1}{2}, \text{ price of } \frac{1}{2} \text{ ton or 1000 lb.}$$

$$1426 \times 4.87\frac{1}{2} \div 1000 = \$6.95175 \textit{ Ans.}$$

(19)

$$\$4.50 \div 2 = \$2.25 ; 3840 \times 2.25 \div 1000 = \$8.640 \text{ Ans.}$$

(20)

$$124 \times 2\frac{1}{4} \times \frac{1}{3} = \$93$$

(21)

$$16200 \div (25 \times 18) = 16200 \div 450 = 36$$

(22)

$$10059.28 \div .92 = 10934 \text{ pwt.} = 45 \text{ lb. 6 oz. 14 pwt. Ans.}$$

(23)

$$4200 \div 84 = 50 \text{ Ans.}$$

(24)

$$640 \times 15 = \$9600 = \text{cost of farm ;}$$

$$160 \times 20 = \$3200 = \text{cost of 160 A. ;}$$

$$240 \times 18 = \$4320 = \text{cost of 240 A. ; } 160 + 240 = 400 \text{ A. sold ;}$$

$$3200 \times 4320 \times 4560 = \$12080 = \text{price received for farm ;}$$

$$12080 - 9600 = 2480 = \text{gain ;}$$

$$640 - 400 = 240 ; 4560 \div 240 = \$19, \text{ price per acre. Ans.}$$

(25)

$$2 \text{ walls, each 65 ft. long ; and 2, each 48 ft. long ;}$$

$$65 \times 2 + 48 \times 2 = 226 ; 226 \times 12 \times 2\frac{1}{2} = 6780 \text{ cu. ft. Ans.}$$

(26)

$$325640 \times 2.37\frac{1}{2} \div 1000 = \$773.395 \text{ Ans.}$$

(27)

$$684 \times 6.20 \div 1000 = \$4.2408 \text{ Ans.}$$

(28)

$$786 \times 2.12\frac{1}{2} \div 100 = \$16.7025 \text{ Ans.}$$



(29)

$$40 \times 16 = 640 \text{ sq. ft. in 1 side.}$$

$$640 \times 144 = 9216 \text{ sq. in.}$$

$$92160 \div 24 = 3840 \text{ shingles on one side of the house.}$$

$$3840 \times 2 = 7680 \text{ on both sides. } \textit{Ans.}$$

(30)

$$14 \text{ lb. } 8 \text{ oz. } 12 \text{ pwt. } 3 \text{ qr. } \div 9 = 1 \text{ lb. } 7 \text{ oz. } 12 \text{ pwt. } 11 \text{ gr. } \textit{Ans.}$$

(31)

$$2688 \div 320 = \$8.40 = \text{cost per bbl. ;}$$

$$8.40 \times 1.60 = \$10 = \text{selling price. } \textit{Ans.}$$

(32)

$$449 \text{ bu. } 1 \text{ pk. } 2 \text{ qt. } \div 182 = 2 \text{ bu. } 1 \text{ pk. } 7 \text{ qt. } \textit{Ans.}$$

(33)

$$4875 \div 750 = \$6.50, \text{ cost per bbl. ; } 7.25 - 6.50 = \$0.75, \text{ gain.}$$

(34)

$$169.00 \div 1.625 = 104 \textit{ Ans.}$$

(35)

$$58 \text{ lb. } \div 3 \text{ lb. } 10 \text{ oz. } = 928 \text{ oz. } \div 58 \text{ oz. } = 16 \textit{ Ans.}$$

(36)

$$1358 \text{ gal. } 2 \text{ qt. } \div 26 = 52 \text{ gal. } 1 \text{ qt. } \textit{Ans.}$$

(37)

$$3801.65 - 3475.25 = \$326.40, \text{ gain ; } 326.40 \div 3.40 = 96 \textit{ Ans.}$$

(38)

$$43313281 + 6500000 + 8500000 = 58313281 ;$$

$$58313281 - 57715000 = 598281 \textit{ Ans.}$$

(39)

12 ft. = 144 in. ; 16 ft. 6 in. = 198 in. ; 264 mi. = 16727040 in. ;  
 $16727040 \div 144 = 116160$  times ;  $16727040 \div 198 = 84480$  times ;  
 $116160 - 84480 = 31680$  times. *Ans.*

(40)

$9 \times 4\frac{1}{3} = 39$  sq. mi. = 24960 acres ;  $24960 \div 192 = 130$  *Ans.*

(41)

$4093850 \div 34337 = 119\frac{7747}{34337}$  *Ans.*

(42)

$89^{\circ} 2' - 75^{\circ} 10' = 13^{\circ} 52'$  diff. long. ;  
 $13^{\circ} 52' \div 15 = 55$  min. 28 sec. diff. time ;  
 $12$  hr. 0 min. 0 sec. - 55 min. 28 sec. = 11 hr. 4 min. 32 sec. *A. M.*

(43)

8 hr. 30 min. diff. time  $\times 15 = 127^{\circ} 30'$  diff. long. *Ans.*

(44)

23 min. diff. time  $\times 15 = 5^{\circ} 45'$  diff. long. ;  
 $73^{\circ} 20' - 5^{\circ} 45' = 67^{\circ} 35' = A$ 's longitude ;  
 $9$  hr. 42 min. - 23 min. = 9 hr. 19 min. *P. M.*, *B*'s time. *Ans.*

(45)

120 C. 7 C. ft. 5 cu. ft.  $\div 11 = 10$  C. 7 C. ft. 15 cu. ft. *Ans.*

(46)

16 cwt. 2 qr. 11 lb. 10 oz.  $\div 9 = 1$  cwt. 3 qr. 9 lb. 10 oz. *Ans.*

(47)

$\$625.40 + \$110.12\frac{1}{2} = \$735.52\frac{1}{2}$  ;  $\$900 - 735.52\frac{1}{2} = \$164.47\frac{1}{2}$

(48)

1775 yr. 4 mo. 19 da.

1492	"	10	"	11	"
------	---	----	---	----	---

282 yr. 6 mo. 8 da. *Ans.*

(49)

1 pt. 3 gil.  $\times 18 =$  3 gal. 3 qt. 1 pt. 2 gil.6 gal.  $\times 3 =$  18 " 0 " 0 " 0 "

2 qt. 1 pt. 3 gil.	$\times 48 =$	34	"	2	"	0	"	0	"
--------------------	---------------	----	---	---	---	---	---	---	---

Quantity drawn = 56 gal. 1 qt. 1 pt. 2 gil.

63 gal. — 56 gal. 1 qt. 1 pt. 2 gil. = 6 gal. 2 qt. 0 pt. 2 gil. *Ans.*

(50)

753689  $\div 5\frac{1}{2} =$  137034 rd. 2 yd.;137034  $\div 40 =$  3425 fur. 34 rd.;3425  $\div 8 =$  428 mi. 1 fur.;428  $\div 69\frac{1}{8} =$  6° 13 mi.;6° 13 mi. 1 fur. 34 rd. 2 yd. *Ans.*

(51)

189 mi. 3 fur. = 1515 fur.

1515 fur. 6 rd. = 60606 rd.

60606 rd. 1 ft. = 1000000 ft.

(52)

768  $\div 24 =$  32 rd. by 1 man;32  $\times 48 =$  1536 rd. by 48 men;1536  $\times 9 =$  13824 rd. in 9 days. *Ans.*

(53)

7913576  $\div 209 =$  37864 = sum; 37864 — 1764 = 36100 *Ans.*

(54)

146 mi. 7 fur. 14 rd. 14 ft.  $\div 5 =$  29 mi. 3 fur. 2 rd. 16 ft. in 1 da.;29 mi. 3 fur. 2 rd. 16 ft.  $\div 2 =$  14 mi. 5 fur. 21 rd. 8 ft. in  $\frac{1}{2}$  da.

(55)

17712.50  $\div 325 =$  \$54.50; \$545.00  $\div 54.50 =$  10 acres. *Ans.*

( 56 )

$4+5=\$9$ =cost of one of each ;  $324\div 9=36$  yd. of each.

( 57 )

68 yd. 3 qr.  $\div 4 = 17$  yd. 0 qr. 3 na. = quantity cut off.

17 yd. 0 qr. 3 na.  $\div 5 = 3$  yd. 1 qr. 3 na. = quantity in a suit.

( 58 )

$\pounds 5$  10s.=1320d. ;  $18+12+10=40$ d.=sum given to one man,  
woman and boy ;  $1320\div 40=33$  of each class. *Ans.*

( 59 )

$20936468 \div 1585 = 13209\frac{203}{1585}$  *Ans.*

( 60 )

6 doz. dozen = 864

$\frac{1}{2}$  doz. dozen = 72

Eggs left = 792

$792 \times 1\frac{1}{2} = \$11.88$  *Ans.*

( 61 )

In the 50 years there were 13 leap years ;

$365 \times 50 + 13 = 18263$  days in 50 years ;

$18263 \times 45 = 821835$  min. = 1 yr. 205 da. 17 hr. 15 min. *A.*

( 62 )

$408434 \times 10.25 = 4186448.50$  = value of flour ;

$2550092 \times 2.12\frac{1}{2} = 5418945.50$  = " of wheat ;

$1048540 \times .94 = 985627.60$  = " of corn ;

*Ans.*  $\$10591021.60$  value of whole.

( 63 )

1858 yr. 1 mo. 10 da. 15 hr. — 1832 yr. 6 mo. 24 da. 6 hr.=

25 yr. 6 mo. 16 da. 9 hr. *Ans.*

( 64 )

$85 \times 5 = \$425$  ;  $25 \times 22 = \$550$  ;  $150 \times 2 = \$300$  ;  $5000 + 425 + 550 + 110 + 300 + 45 + 174 + 450 + 380 = \$7434$  ;  $7434 \div 3 = \$2478$ , widow's share ;  $7434 - 2478 = \$4956$  ;  $4956 \div 4 = \$1239$ , each child's share. *Ans.*

( 65 )

$55 \times 16\frac{1}{2} \times 2 = 1815$  sq. ft.  $= 261360$  sq. in.  $=$  surface of two sides of roof ;  $\frac{1}{3}$  of 15 in.  $= 5$  in. ;  $5 \times 4 = 20$  sq. in. ;  $261360 \div 20 = 13068$  shingles. *Ans.*

( 66 )

$77^\circ 2'$  West  $+ 30^\circ 45'$  East  $= 107^\circ 47'$  diff. long. ;  
 $107^\circ 47' \div 15 = 7$  hr. 11 min. 8 sec. diff. time ;  
 $6$  hr.  $+ 7$  hr. 11 min. 8 sec.  $= 13$  hr. 11 min. 8 sec. ; or,  
 $1$  hr. 11 min. 8 sec. P. M. *Ans.*

( 67 )

$1$  hr. 44 min.  $\times 15 = 26^\circ 0'$  diff. long. ; or the place is  $26^\circ$  East of New York ;  $3$  hr. 12 min.  $+ 1$  hr. 44 min.  $= 4$  hr. 56 min. P. M., time. *Ans.*

( 68 )

$45 - 25 = 20$  gal. left in cistern every hour ;  
 $960 \div 20 = 48$  hr.  $=$  time to fill it. *Ans.*

( 69 )

$6500500 \times .50 = \$3250250$  ;  $3250250 \div 750 = 4333\frac{2}{3}$  *Ans.*

( 70 )

$2180 - 500 = \$1680$  ;  $1680 \div 840 = \$2$ , *Ans.*

( 71 )

$37\frac{1}{2} \times 30 = \$11.25$ , value of potatoes ;  $.45 \times 6 = \$2.70$ , value of molasses ;  $.06\frac{1}{2} \times 60 = \$3.90$ , value of mackerel ;  $2.70 + 3.90 = \$6.60$  ;  $11.25 - 6.60 = \$4.65$  ;  $4.65 \div .10 = 46\frac{5}{8}$  lb. *Ans.*

( 72 )

$174 \text{ mi. } 1 \text{ fur. } \div 12 \text{ mi. } 3 \text{ fur. } 20 \text{ rd.} = 55720 \div 3980 = 14 \text{ days.}$

( 73 )

$2 \text{ bbl. } 12 \text{ gal. } 2 \text{ qt. } \times 12 = 28 \text{ bbl. } 6 \text{ gal}$

( 74 )

$550 \text{ pt.} = 2 \text{ bbl. } 5 \text{ gal. } 3 \text{ qt.}$  ;  $400 \text{ qt.} = 3 \text{ bbl. } 5 \text{ gal. } 2 \text{ qt.}$  ;  
 $350 \text{ two quarts} = 5 \text{ bbl. } 17 \text{ gal. } 2 \text{ qt.}$  ;  $375 \text{ three quarts} = 8 \text{ bbl. } 29 \text{ gal. } 1 \text{ qt.}$  ;  $150 \text{ gal.} = 4 \text{ bbl. } 24 \text{ gal.}$  ;  $2 \text{ bbl. } 5 \text{ gal. } 3 \text{ qt.} + 3 \text{ bbl. } 5 \text{ gal. } 2 \text{ qt.} + 5 \text{ bbl. } 17 \text{ gal. } 2 \text{ qt.} + 8 \text{ bbl. } 29 \text{ gal. } 1 \text{ qt.} + 4 \text{ bbl. } 24 \text{ gal.} = 24 \text{ bbl. } 19 \text{ gal.}$  *Ans.*

( 75 )

$18 \times 16 = 288 \text{ sq. ft.}$  ;  $288 \times 2 = 576 \text{ sq. ft. in both}$  ;  $576 \div 9 = 64 \text{ sq. yd.}$  ;  $64 \times \$1.33\frac{1}{3} = \$85.33\frac{1}{3}$  *Ans.*

( 76 )

$22 \times 2 = 44$  ;  $16 \times 2 = 32$  ;  $44 + 32 = 76 \text{ ft.}$  ;  $76 \times 9 = 684 \text{ sq. ft.}$  ;  
 $10 \text{ yd.} = 30 \text{ ft.}$  ;  $30 \times 2 = 60 \text{ sq. ft.}$  ;  $684 \text{ sq. ft.} \div 60 \text{ sq. ft.} = 11\frac{4}{5}$  rolls. *Ans.*

( 77 )

$1 \text{ mi. } 4 \text{ fur. } 20 \text{ rd.} = 500 \text{ rd.}$  If to gain 5 rods he must travel 25 rods ; to gain 500 rods he must travel as many times 25 rods as 5 rods is contained times in 500 rods, which is 100 ; therefore, he must travel 100 times 25 rods  $= 2500 \text{ rods} = 7 \text{ mi. } 6 \text{ fur. } 20 \text{ rd.}$  *Ans.*

(78)

$\$1.75 \times 500 = \$875.00$  ;  $875.00 \div .05 = 17500$  lb. ;  
 $17500 \div 2 = 8750$  lb. sold = quantity left. *Ans.*

(79)

$\$12.875 \times 7 = \$90.125$ , cost of the whole ;  $7 - 2 = 5$  ;  
 $\$90.125 \div 5 = \$18.025$ , what he received per barrel.

(80)

$\$26250 - \$18750 = \$7500$ , whole gain ;  
 $7500 \div 3 = 2500$  barrels. *Ans.*

(81)

$(964 \text{ bu. } 2 \text{ pk. } 4 \text{ qt.}) \div 2 = 482 \text{ bu. } 1 \text{ pk. } 2 \text{ qt.}$  the first one's share ;  
 $(482 \text{ bu. } 1 \text{ pk. } 2 \text{ qt.}) \div 3 = 160 \text{ bu. } 3 \text{ pk. } 0 \text{ qt. } 1\frac{1}{3} \text{ pt. } 2 \text{ d}$  one's share ;  
 $482 \text{ bu. } 1 \text{ pk. } 2 \text{ qt.} + 160 \text{ bu. } 3 \text{ pk. } 0 \text{ qt. } 1\frac{1}{3} \text{ pt.} = 643 \text{ bu. } 0 \text{ pk. } 2 \text{ qt. } 1\frac{1}{3} \text{ pt.}$  ;  
 $964 \text{ bu. } 2 \text{ pk. } 4 \text{ qt.} - 643 \text{ bu. } 0 \text{ pk. } 2 \text{ qt. } 1\frac{1}{3} \text{ pt.} = 321 \text{ bu. } 2 \text{ pk. } 1 \text{ qt. } \frac{2}{3} \text{ pt.}$ , third share.

(82)

$70^\circ 25'$	$105^\circ 30' 56''$	$156^\circ 26' 36''$
$46^\circ 50'$	$10^\circ 5' 40''$	$115^\circ 36' 36''$
$39^\circ 11' 36''$	$115^\circ 36' 36''$ West.	$40^\circ 50' 00''$ E.
$156^\circ 26' 36''$ E.		

$40^\circ 50' + 77^\circ = 117^\circ 50' = 7070'$  ;  $3^\circ 20' = 200'$  ;  $7070' \div 200' = 35\frac{7}{10}$  days. *Ans.*

(83)

$\$25000 \div 125 = \$200$ , one share ;  $\$200 \times 12 = \$2400$ , Captain's share ;  $\$200 \times 2 \times 5 = \$2000$ , the Lieutenants' shares ;  $\$200 \times 6 \times 3 = \$3600$ , the Midshipmen's shares ;  $2400 + 2000 + 3600 = \$8000$  ;  $25000 - 8000 = \$17000$  ;  $\$17000 \div 85 = \$200$ , each sailor's share. *Ans.*

( 84 )

1 hr. 5 min. 44 sec.  $\times 15 = 16^{\circ} 26' 0''$  diff. long. ;  
 $71^{\circ} 4' + 16^{\circ} 26' = 87^{\circ} 30'$  long. of Chicago. *Ans.*

( 85 )

8 hr. 27 min. 30 sec. + 1 hr. 5 m. 44 sec. = 9 hr. 33 m. 14 sec. A. M.

( 86 )

12 hr. 0 min. 0 sec. - 1 hr. 5 m. 44 sec. = 10 hr. 54 m. 16 sec. A. M.

( 87 )

1 hr. 16 min.  $\times 15 = 19^{\circ} 0' 0''$  *Ans.*

( 88 )

$20 \times 16 \times 12 = 3840$  E. E. ;  $3840 \times 5 \div 4 = 4800$  yd. *Ans.*

( 89 )

$8968 + 1060 = \$10028 =$  price for the whole ;  
 $10028 - 2618 = \$7410 =$  price at which he must sell the  
 remainder.

( 90 )

24 lb. 4 oz. 6 pwt. 18 gr.  $\div 11$  pwt. 9 gr. = 140322 gr.  $\div 273$  gr. =  
 514 *Ans.*

( 91 )

$740 \times 2 = \$1480$  ;  $3284.82 - 1480 = \$1804.82 =$  value at \$1.42 ;  
 $1804.82 \div 1.42 = 1271$  bu. ;  $1271 + 740 = 2011$  bu.

( 92 )

105 A. 2 R. 20 P. = 16900 P., whose value, at \$1, is \$16900 ;  
 its payment will require 16900 hours = 1 yr. 338 da. 22 hr.



( 93 )

$98 + 46 = 144 = \text{twice the larger number ;}$

$144 \div 2 = 72 = \text{larger number ; } 72 - 46 = 26 = \text{smaller. Ans.}$

( 94 )

$190 - 76 = \$114 = \text{twice the value of the cow ;}$

$\frac{1}{2}$  of  $\$114 = \$57 = \text{value of cow ; } 57 + 76 = \$133 = \text{val. of horse.}$

( 95 )

27 days in March.

30 " " April.

31 " " May.

30 " " June.

31 " " July.

21 " " August.

170 days. Ans.

( 96 )

$870 \times 9\frac{1}{2} = \$8265$ , whole cost ;

$8265 \div 2 = \$4132.50$ , half cost ;

$\frac{1}{4}$  of  $4132.50 = 1033.12\frac{1}{2} = \text{loss ;}$

$870 \div 2 = 435$ , quantity injured ;

$435 \text{ bbl.} = 435 \times 2 = 870 \frac{1}{2} \text{ bbl. ;}$

$1033.12\frac{1}{2} \div 870 = \$1.1875$  Ans.

( 97 )

$675 + 812 = \$1487 = \text{amount for extra services ;}$

$24612 - 1487 = \$23125 = \text{amount to be equally divided ;}$

$23125 \div 3 = \$7708.33\frac{1}{3}$ , C's share ;  $7708.33\frac{1}{3} + 675 = \$8383.33\frac{1}{3}$ ,

A's share ;  $7708.33\frac{1}{3} + 812 = \$8520.33\frac{1}{3}$ , B's share.

( 98 )

$6750 + 3500 + 156 + 364 = \$10770 = \text{expenses ;}$

$250 + 175 + 95 = 520 = \text{allowances ;}$

$\$11290 = \text{deduction.}$

$56895 - 11290 = \$45605$ , net profit ;

$45605 \div 4 = \$11401.25 = \text{share of 4th ;}$

$11401.25 + 250 = \$11651.25 = \text{1st ;}$

$11401.25 + 175 = \$11576.25 = \text{2d ;}$

$11401.25 + 95 = \$11496.25 = \text{3d.}$

## PROPERTIES OF NUMBERS.

(1)

$\begin{array}{r} 3 \overline{)9} \\ 3 \overline{)3} \\ 1 \end{array}$	..	$\begin{array}{r} 2 \overline{)10} \\ 5 \overline{)5} \\ 1 \end{array}$	..	$\begin{array}{r} 2 \overline{)12} \\ 2 \overline{)6} \\ 3 \end{array}$	..	$\begin{array}{r} 2 \overline{)14} \\ 7 \\ 2 \text{ and } 7 \end{array}$	..	$\begin{array}{r} 2 \overline{)16} \\ 2 \overline{)8} \\ 2 \overline{)4} \\ 2 \end{array}$
3 and 3	..	2 and 5	..	2, 2, and 3				2, 2, 2 & 2

$\begin{array}{r} 2 \overline{)18} \\ 3 \overline{)9} \\ 3 \end{array}$	..	$\begin{array}{r} 2 \overline{)24} \\ 2 \overline{)12} \\ 2 \overline{)6} \\ 3 \end{array}$	..	$\begin{array}{r} 3 \overline{)27} \\ 3 \overline{)9} \\ 3 \end{array}$	..	$\begin{array}{r} 2 \overline{)28} \\ 2 \overline{)14} \\ 7 \end{array}$
2, 3 and 3		3		3, 3 and 3	..	2, 2 and 7
		2, 2, 2 and 3				

(2)

$\begin{array}{r} 2 \overline{)30} \\ 3 \overline{)15} \\ 5 \end{array}$	..	$\begin{array}{r} 2 \overline{)22} \\ 11 \\ 2 \text{ and } 11 \end{array}$	..	$\begin{array}{r} 2 \overline{)32} \\ 2 \overline{)16} \\ 2 \overline{)8} \\ 2 \overline{)4} \\ 2 \end{array}$	..	$\begin{array}{r} 2 \overline{)36} \\ 2 \overline{)18} \\ 3 \overline{)9} \\ 3 \end{array}$
2, 3 and 5				2		2, 2, 3 and 3
				2, 2, 2, 2 and 2		

$\begin{array}{r} 2 \overline{)38} \\ 19 \\ 2 \text{ and } 19 \end{array}$	..	$\begin{array}{r} 2 \overline{)40} \\ 2 \overline{)20} \\ 2 \overline{)10} \\ 5 \end{array}$	..	$\begin{array}{r} 5 \overline{)45} \\ 3 \overline{)9} \\ 3 \end{array}$	..	$\begin{array}{r} 7 \overline{)49} \\ 7 \\ 7 \text{ and } 7 \end{array}$
		5		5, 3 and 3		
		2, 2, 2 and 5				

( 3 )

$\begin{array}{r} 2 \overline{)50} \\ 5 \overline{)25} \\ \hline 5 \end{array}$	..	$\begin{array}{r} 2 \overline{)56} \\ 2 \overline{)28} \\ \hline 2 \overline{)14} \\ 7 \end{array}$	..	$\begin{array}{r} 2 \overline{)58} \\ 29 \\ 2 \text{ and } 29 \end{array}$	..	$\begin{array}{r} 2 \overline{)60} \\ 2 \overline{)30} \\ 3 \overline{)15} \\ 5 \end{array}$	..	$\begin{array}{r} 2 \overline{)64} \\ 2 \overline{)32} \\ 2 \overline{)16} \\ 2 \overline{)8} \\ 2 \overline{)4} \\ 2 \end{array}$
2, 5 and 5		2, 2, 2 and 7				2, 2, 3 and 5		2, 2, 2, 2, 2 and 2

$\begin{array}{r} 2 \overline{)66} \\ 11 \overline{)33} \\ \hline 3 \end{array}$	..	$\begin{array}{r} 2 \overline{)68} \\ 2 \overline{)34} \\ \hline 17 \end{array}$	..	$\begin{array}{r} 2 \overline{)70} \\ 7 \overline{)35} \\ \hline 5 \end{array}$	..	$\begin{array}{r} 2 \overline{)72} \\ 2 \overline{)36} \\ 2 \overline{)18} \\ 3 \overline{)9} \\ 3 \end{array}$
2, 11 and 3	..	2, 2 and 17	..	2, 7 and 5		2, 2, 2, 3 and 3

( 4 )

$\begin{array}{r} 2 \overline{)76} \\ 2 \overline{)38} \\ \hline 19 \end{array}$	..	$\begin{array}{r} 2 \overline{)78} \\ 3 \overline{)39} \\ \hline 13 \end{array}$	..	$\begin{array}{r} 2 \overline{)80} \\ 2 \overline{)40} \\ 2 \overline{)20} \\ 2 \overline{)10} \\ 5 \end{array}$	..	$\begin{array}{r} 2 \overline{)82} \\ 41 \\ 2 \text{ and } 41 \end{array}$
2, 2 and 19	..	2, 3 and 13		2, 2, 2, 2, and 5		

$\begin{array}{r} 2 \overline{)84} \\ 2 \overline{)42} \\ 3 \overline{)21} \\ \hline 7 \end{array}$	..	$\begin{array}{r} 2 \overline{)86} \\ 43 \\ 2 \text{ and } 43 \end{array}$	..	$\begin{array}{r} 2 \overline{)88} \\ 2 \overline{)44} \\ 2 \overline{)22} \\ \hline 11 \end{array}$	..	$\begin{array}{r} 2 \overline{)90} \\ 5 \overline{)45} \\ 3 \overline{)9} \\ \hline 3 \end{array}$
2, 2, 3 and 7				2, 2, 2 and 11	..	2, 5, 3 and 3

(5)

<u>2)100</u>	..	<u>2)102</u>	..	<u>2)104</u>	..	<u>5)275</u>
<u>2)50</u>		<u>3)51</u>		<u>2)52</u>		<u>5)55</u>
<u>5)25</u>		17		<u>2)26</u>		11
5		2, 3 and 17		13		5, 5 and 11
2, 2, 5 and 5		2, 2, 2, and 13				
<u>2)960</u>	..	<u>2)472</u>	..	<u>2)160</u>	..	<u>2)836</u>
<u>2)480</u>		<u>2)236</u>		<u>2)80</u>		<u>2)418</u>
<u>2)240</u>		<u>2)118</u>		<u>2)40</u>		<u>11)209</u>
<u>2)120</u>		59		<u>2)20</u>		19
<u>2)60</u>		2, 2, 2 and 59		<u>2)10</u>		2, 2, 11 & 19
<u>2)30</u>				5		
<u>3)15</u>				2, 2, 2, 2 & 5		
5						

(6)

<u>5)105</u>	..	<u>2)106</u>	..	<u>2)108</u>	..	<u>2)110</u>	..	<u>5)115</u>
<u>3)21</u>		<u>53</u>		<u>2)54</u>		<u>5)55</u>		<u>23</u>
7		2 and 53		<u>3)27</u>		11		5 and 23
5, 3 and 7				<u>3)9</u>		2, 5 and 11		
				3				
				2, 2, 3, 3 & 3				

[illegible]

$$\begin{array}{r} (1) \\ 5 \overline{)150 \cdot 210 \cdot 270} \\ 3 \overline{)30 \cdot 42 \cdot 54} \\ 2 \overline{)10 \cdot 14 \cdot 18} \\ 5 \cdot 7 \cdot 9 \end{array}$$

5, 3 &amp; 2 are the c. p. f.

$$\begin{array}{r} (2) \\ 2 \overline{)42 \cdot 126 \cdot 168} \\ 3 \overline{)21 \cdot 63 \cdot 84} \\ 7 \overline{)7 \cdot 21 \cdot 28} \\ 1 \cdot 3 \cdot 4 \end{array}$$

2, 3 &amp; 7 are c. p. f.

$$\begin{array}{r} (3) \\ 5 \overline{)105 \cdot 315 \cdot 525} \\ 3 \overline{)21 \cdot 63 \cdot 105} \\ 7 \overline{)7 \cdot 21 \cdot 35} \\ 1 \cdot 3 \cdot 5 \end{array}$$

5, 3 &amp; 7 are c. p. f.

$$\begin{array}{r} (4) \\ 2 \overline{)84 \cdot 126 \cdot 210} \\ 3 \overline{)42 \cdot 63 \cdot 105} \\ 7 \overline{)14 \cdot 21 \cdot 35} \\ 2 \cdot 3 \cdot 5 \end{array}$$

2, 3 and 7 are c. p. f.

$$\begin{array}{r} (5) \\ 2 \overline{)168 \cdot 256 \cdot 410 \cdot 820} \\ 84 \cdot 128 \cdot 205 \cdot 410 \end{array}$$

2 is the c. p. f.

## CANCELLATION.

$$\begin{array}{r} (1) \\ \begin{array}{c} 2 \\ 2 \times 4 \times 8 \times 13 \times 7 \times 16 \\ 26 \times 14 \times 8 \\ 13 \quad 2 \end{array} = 32 \text{ Ans.} \end{array}$$

$$\begin{array}{r} (2) \\ \begin{array}{c} 3 \quad 5 \quad 2 \\ 42 \times 3 \times 25 \times 12 \\ 28 \times 4 \times 15 \times 6 \\ 4 \quad 2 \quad 3 \\ 2 \end{array} = \frac{15}{4} = 3\frac{3}{4} \end{array}$$

$$\begin{array}{r} (3) \\ \begin{array}{c} 5 \quad 2 \quad 14 \\ 125 \times 60 \times 24 \times 42 \\ 25 \times 120 \times 36 \times 5 \\ 2 \quad 3 \end{array} = 14 \text{ Ans.} \end{array}$$

$$\begin{array}{r} (4) \\ \begin{array}{c} 4 \quad 6 \quad 2 \\ 44 \times 18 \times 26 \times 14 \\ 11 \times 39 \times 7 \times 2 \\ 3 \end{array} = 48 \text{ Ans.} \end{array}$$

$$\begin{array}{r} (5) \\ \begin{array}{c} 40 \quad 2 \quad 2 \\ 240 \times 8 \times 114 \times 5 \\ 57 \times 24 \times 15 \times 6 \\ 6 \quad 3 \quad 3 \end{array} = \frac{80}{9} = 8\frac{8}{9} \end{array}$$

$$\begin{array}{r} (6) \\ \begin{array}{c} 2 \quad 7 \\ 46 \times 49 \\ 21 \times 23 \\ 3 \end{array} = \frac{14}{3} = 4\frac{2}{3} \end{array}$$

(7)

$$\begin{array}{r} 2 \quad 4 \\ 192 \times 88 \\ \hline 96 \times 22 \end{array} = 8 \text{ Ans.}$$

(8)

$$\begin{array}{r} 7 \\ 14 \quad 4 \\ 42 \times 72 \\ \hline 40 \times 18 \times 27 \\ 5 \quad 9 \end{array} = 7 \frac{1}{3} \text{ Ans.}$$

(9)

$$\begin{array}{r} 16 \quad 7 \\ 48 \quad 49 \quad 2 \\ 240 \times 441 \times 16 \\ \hline 175 \times 56 \times 27 \\ 35 \quad 7 \quad 3 \\ 5 \end{array} = 3 \frac{2}{5} = 6 \frac{2}{5} \text{ Ans.}$$

(10)

$$\begin{array}{r} 3 \\ 21 \quad 2 \\ 840 \times 64 \times 124 \times 9 \\ \hline 560 \times 32 \times 31 \times 4 \\ 14 \end{array} = 27 \text{ Ans.}$$

(11)

$$\begin{array}{r} 9 \\ 7 \times 18 \\ \hline 14 \end{array} = 9 \text{ Ans.}$$

(12)

$$\begin{array}{r} 4 \\ 9 \times 40 \times 5 \\ \hline 50 \end{array} = 36$$

(13)

$$\begin{array}{r} 46 \\ 1.84 \times 12 \\ \hline .48 \\ 4 \end{array} = 46$$

(14)

$$\begin{array}{r} 7 \\ 8 \times 175 \times 4 \\ \hline 25 \times 56 \end{array} = 4 \text{ Ans.}$$

(15)

$$\begin{array}{r} 5 \\ 20 \times 10 \\ \hline 12 \\ 3 \end{array} = \frac{50}{3} = 16 \frac{2}{3} \text{ Ans.}$$

(16)

$$\begin{array}{r} 3 \quad 8 \\ 1050 \times 96 \\ \hline 350 \times 36 \end{array} = 8 \text{ Ans.}$$

(17)

87 + 60 + 45 = 192 = value of one of each.

$$\begin{array}{r} 23 \quad 41 \\ 184 \times 492 \\ \hline 192 \\ 162 \end{array} = \frac{943}{2} = 471 \frac{1}{2} \text{ Ans.}$$

(18)

$$\begin{array}{r} 3 \quad 5 \\ 42 \times 250 \\ \hline 700 \\ 50 \end{array} = 15 \text{ Ans.}$$

(19)

$$\begin{array}{r} 621 \quad 10 \\ 2484 \times 120 \\ \hline 48 \\ 4 \end{array} = 6210 \text{ Ans.}$$

(20)

$$\begin{array}{r} 3 \\ 9 \times 12 = \frac{27}{4} = 6\frac{3}{4} \text{ Ans.} \\ 16 \\ 4 \end{array}$$

(21)

$$\begin{array}{r} 5 \quad 7 \\ 10 \times 14 \times 6 = \frac{35}{2} = 17\frac{1}{2} \text{ Ans.} \\ 16 \\ 8 \\ 4 \\ 2 \end{array}$$

(22)

$$\begin{array}{r} 3 \\ 27 \times 15 = \frac{45}{4} = 11\frac{1}{4} \text{ Ans.} \\ 36 \\ 4 \end{array}$$

(23)

$$\begin{array}{r} 9 \quad 3 \\ 15 \times 3 \times 12 \times 4 = \frac{9}{2} = 4\frac{1}{2} \text{ Ans.} \\ 72 \times 20 \\ 8 \quad 5 \\ 2 \end{array}$$

## LEAST COMMON MULTIPLE.

(1)

$$\begin{array}{r} 2) 4 \dots 9 \dots 10 \dots 15 \dots 18 \dots 20 \dots 21 \\ \hline 2) 2 \dots 9 \dots 5 \dots 15 \dots 9 \dots 10 \dots 21 \\ \hline 3) 1 \dots 9 \dots 5 \dots 15 \dots 9 \dots 5 \dots 21 \\ \hline 3) 1 \dots 3 \dots 5 \dots 5 \dots 3 \dots 5 \dots 7 \\ \hline 5) 1 \dots 1 \dots 5 \dots 5 \dots 1 \dots 5 \dots 7 \\ \hline 1 \dots 1 \dots 1 \dots 1 \dots 1 \dots 1 \dots 1 \dots 7 \\ 2 \times 2 \times 3 \times 3 \times 5 \times 7 = 1260 \text{ Ans.} \end{array}$$

(2)

$$\begin{array}{r} 2) 8 \dots 9 \dots 10 \dots 12 \dots 25 \dots 32 \dots 75 \dots 80 \\ \hline 2) 4 \dots 9 \dots 5 \dots 6 \dots 25 \dots 16 \dots 75 \dots 40 \\ \hline 2) 2 \dots 9 \dots 5 \dots 3 \dots 25 \dots 8 \dots 75 \dots 20 \\ \hline 2) 1 \dots 9 \dots 5 \dots 3 \dots 25 \dots 4 \dots 75 \dots 10 \\ \hline 3) 1 \dots 9 \dots 5 \dots 3 \dots 25 \dots 2 \dots 75 \dots 5 \\ \hline 5) 1 \dots 3 \dots 5 \dots 1 \dots 25 \dots 2 \dots 25 \dots 5 \\ \hline 5) 1 \dots 3 \dots 1 \dots 1 \dots 5 \dots 2 \dots 5 \dots 1 \\ \hline 1 \dots 3 \dots 1 \dots 1 \dots 1 \dots 2 \dots 1 \dots 1 \\ 2 \times 2 \times 2 \times 2 \times 3 \times 5 \times 5 \times 3 \times 2 = 7200 \text{ Ans.} \end{array}$$

(3)

$$2) 1 \dots 2 \dots 3 \dots 4 \dots 5 \dots 6 \dots 7 \dots 9$$

$$3) 1 \dots 1 \dots 3 \dots 2 \dots 5 \dots 3 \dots 7 \dots 9$$

$$1 \dots 1 \dots 1 \dots 2 \dots 5 \dots 1 \dots 7 \dots 3$$

$$2 \times 3 \times 2 \times 5 \times 7 \times 3 = 1260 \text{ Ans.}$$

(4)

$$2) 9 \dots 16 \dots 42 \dots 63 \dots 21 \dots 14 \dots 72$$

$$2) 9 \dots 8 \dots 21 \dots 63 \dots 21 \dots 7 \dots 36$$

$$2) 9 \dots 4 \dots 21 \dots 63 \dots 21 \dots 7 \dots 18$$

$$3) 9 \dots 2 \dots 21 \dots 63 \dots 21 \dots 7 \dots 9$$

$$3) 3 \dots 2 \dots 7 \dots 21 \dots 7 \dots 7 \dots 3$$

$$7) 1 \dots 2 \dots 7 \dots 7 \dots 7 \dots 7 \dots 1$$

$$1 \dots 2 \dots 1 \dots 1 \dots 1 \dots 1 \dots 1$$

$$2 \times 2 \times 2 \times 3 \times 3 \times 7 \times 2 = 1008 \text{ Ans.}$$

(5)

$$5) 7 \dots 15 \dots 21 \dots 28 \dots 35 \dots 100 \dots 125$$

$$5) 7 \dots 3 \dots 21 \dots 28 \dots 7 \dots 20 \dots 25$$

$$7) 7 \dots 3 \dots 21 \dots 28 \dots 7 \dots 4 \dots 5$$

$$3) 1 \dots 3 \dots 3 \dots 4 \dots 1 \dots 4 \dots 5$$

$$2) 1 \dots 1 \dots 1 \dots 4 \dots 1 \dots 4 \dots 5$$

$$2) 1 \dots 1 \dots 1 \dots 2 \dots 1 \dots 2 \dots 5$$

$$1 \dots 1 \dots 1 \dots 1 \dots 1 \dots 1 \dots 5$$

$$5 \times 5 \times 7 \times 3 \times 2 \times 2 \times 5 = 10500 \text{ Ans.}$$



(6)

2)	15	..	16	..	18	..	20	..	24	..	25	..	27	..	30
----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----

2)	15	..	8	..	9	..	10	..	12	..	25	..	27	..	15
----	----	----	---	----	---	----	----	----	----	----	----	----	----	----	----

2)	15	..	4	..	9	..	5	..	6	..	25	..	27	..	15
----	----	----	---	----	---	----	---	----	---	----	----	----	----	----	----

3)	15	..	2	..	9	..	5	..	3	..	25	..	27	..	15
----	----	----	---	----	---	----	---	----	---	----	----	----	----	----	----

3)	5	..	2	..	3	..	5	..	1	..	25	..	9	..	5
----	---	----	---	----	---	----	---	----	---	----	----	----	---	----	---

5)	5	..	2	..	1	..	5	..	1	..	25	..	3	..	5
----	---	----	---	----	---	----	---	----	---	----	----	----	---	----	---

1	..	2	..	1	..	1	..	1	..	5	..	3	..	1
---	----	---	----	---	----	---	----	---	----	---	----	---	----	---

$$2 \times 2 \times 2 \times 3 \times 3 \times 5 \times 2 \times 5 \times 3 = 10800 \text{ Ans.}$$

(7)

2)	9	..	18	..	27	..	36	..	45	..	54
----	---	----	----	----	----	----	----	----	----	----	----

3)	9	..	9	..	27	..	18	..	45	..	27
----	---	----	---	----	----	----	----	----	----	----	----

3)	3	..	3	..	9	..	6	..	15	..	9
----	---	----	---	----	---	----	---	----	----	----	---

3)	1	..	1	..	3	..	2	..	5	..	3
----	---	----	---	----	---	----	---	----	---	----	---

1	..	1	..	1	..	2	..	5	..	1
---	----	---	----	---	----	---	----	---	----	---

$$2 \times 3 \times 3 \times 3 \times 2 \times 5 = 540 \text{ Ans.}$$

(8)

2)	4	..	10	..	14	..	15	..	21
----	---	----	----	----	----	----	----	----	----

5)	2	..	5	..	7	..	3	..	21
----	---	----	---	----	---	----	---	----	----

7)	2	..	1	..	7	..	3	..	21
----	---	----	---	----	---	----	---	----	----

3)	2	..	1	..	1	..	3	..	3
----	---	----	---	----	---	----	---	----	---

2	..	1	..	1	..	1	..	1
---	----	---	----	---	----	---	----	---

$$2 \times 5 \times 7 \times 3 \times 2 = 420 \text{ Ans.}$$

(9)

2)	7	..	14	..	16	..	21	..	24
2)	7	..	7	..	8	..	21	..	12
2)	7	..	7	..	4	..	21	..	6
3)	7	..	7	..	2	..	21	..	3
7)	7	..	7	..	2	..	7	..	1
	1	..	1	..	2	..	1	..	1

$$2 \times 2 \times 2 \times 3 \times 7 \times 2 = 336 \text{ Ans.}$$

(10)

7)	49	..	14	..	84	..	168	..	98
7)	7	..	2	..	12	..	24	..	14
2)	1	..	2	..	12	..	24	..	2
2)	1	..	1	..	6	..	12	..	1
3)	1	..	1	..	3	..	6	..	1
	1	..	1	..	1	..	2	..	1

$$7 \times 7 \times 2 \times 2 \times 3 \times 2 = 1176 \text{ Ans.}$$

(11)

2)	9	..	12	..	16
2)	9	..	6	..	8
3)	9	..	3	..	4
	3	..	1	..	4

$$2 \times 2 \times 3 \times 3 \times 4 = 144 \text{ rods of ditch.}$$

$$144 \div 9 = 16 \text{ days} = \text{A's time.}$$

$$144 \div 12 = 12 \text{ " } = \text{B's "}$$

$$144 \div 16 = 9 \text{ " } = \text{C's "}$$

(12)

2)	15	..	16	..	21	..	24
2)	15	..	8	..	21	..	12
2)	15	..	4	..	21	..	6
3)	15	..	2	..	21	..	3
	5	..	2	..	7	..	1

The L. C. M., \$1680, is the least amount that will exactly pay either class of the workmen.

$$1680 \div 15 = 112 \text{ men in 1st class.}$$

$$1680 \div 16 = 105 \text{ " " 2d "}$$

$$1680 \div 21 = 80 \text{ " " 3d "}$$

$$2 \times 2 \times 2 \times 3 \times 5 \times 2 \times 7 = 1680 \quad 1680 \div 24 = 70 \text{ " " 4th "}$$

(13)

3)  $\begin{array}{cccc} 2 & . & 3 & . & 7 & . & 15 \\ 2 & . & 1 & . & 7 & . & 5 \end{array}$  The L. C. M., 210 bu., is the least number that will exactly fill either class.

$3 \times 2 \times 7 \times 5 = 210$      $210 \div 2 = 105$  bags ;  $210 \div 3 = 70$  bbl. ;  
 $210 \div 7 = 30$  boxes ;  $210 \div 15 = 14$  hhd.

(14)

Find the number of days required by each to perform the circuit. The lowest common multiple of these numbers will be the number of days required for them to meet at the same point.

$300 \div 15 = 20$  da. = A's time.

$300 \div 20 = 15$  da. = B's "

$300 \div 25 = 12$  da. = C's "

$300 \div 30 = 10$  da. = D's "

In 60 days will be traveled, by

A,  $15 \times 60 = 900$  mi. = 3 circuits.

B,  $20 \times 60 = 1200$  mi. = 4 "

C,  $25 \times 60 = 1500$  mi. = 5 "

D,  $30 \times 60 = 1800$  mi. = 6 "

2)  $\begin{array}{cccc} 10 & . & 12 & . & 15 & . & 20 \\ 2 & ) & 5 & . & 6 & . & 15 & . & 10 \end{array}$

3)  $\begin{array}{cccc} 5 & . & 3 & . & 15 & . & 5 \end{array}$

5)  $\begin{array}{cccc} 5 & . & 1 & . & 5 & . & 5 \end{array}$

$\begin{array}{cccc} 1 & . & 1 & . & 1 & . & 1 \end{array}$

$2 \times 2 \times 3 \times 5 = 60$  da.

## GREATEST COMMON DIVISOR.

(2)

$18 = 2 \times 3 \times 3$

$36 = 2 \times 3 \times 3 \times 2$

2, 3 and 3 are common.

$2 \times 3 \times 3 = 18 = \text{G. C. D.}$

(3)

$12 = 2 \times 2 \times 3$

$24 = 2 \times 2 \times 3 \times 2$

$60 = 2 \times 2 \times 3 \times 5$

2, 2 and 3 are common.

$2 \times 2 \times 3 = 12 = \text{G. C. D.}$

(4)

$$15 = 3 \times 5$$

$$50 = 5 \times 5 \times 2$$

$$40 = 5 \times 2 \times 2 \times 2$$

5 is common.

$$5 = \text{G. C. D.}$$

(5)

$$24 = 2 \times 2 \times 2 \times 3$$

$$18 = 2 \times 3 \times 3$$

$$144 = 2 \times 2 \times 2 \times 2 \times 3 \times 3$$

2 and 3 are common.

$$2 \times 3 = 6 = \text{G. C. D.}$$

(6)

$$50 = 2 \times 5 \times 5$$

$$100 = 2 \times 2 \times 5 \times 5$$

$$80 = 2 \times 2 \times 2 \times 2 \times 5$$

2 and 5 are common.

$$2 \times 5 = 10 = \text{G. C. D.}$$

(7)

$$56 = 2 \times 2 \times 2 \times 7$$

$$84 = 2 \times 2 \times 3 \times 7$$

$$140 = 2 \times 2 \times 7 \times 5$$

2, 2 and 7 are common.

$$2 \times 2 \times 7 = 28 = \text{G. C. D.}$$

(1)

$$3328 \overline{) 4592} (1$$

$$3328$$

$$1264 \overline{) 3328} (2$$

$$2528$$

$$800 \overline{) 1264} (1$$

$$800$$

$$464 \overline{) 800} (1$$

$$464$$

$$336 \overline{) 464} (1$$

$$336$$

$$128 \overline{) 336} (2$$

$$256$$

$$80 \overline{) 128} (1$$

$$80$$

$$48 \overline{) 80} (1$$

$$48$$

$$32 \overline{) 48} (1$$

$$32$$

$$16 \overline{) 32} (2$$

$$32$$

$$16 = \text{G. C. D.}$$

(2)

$$2205 \overline{) 4501} (2$$

$$4410$$

$$91 \overline{) 2205} (24$$

$$182$$

$$385$$

$$364$$

$$21 \overline{) 91} (4$$

$$84$$

$$7 \overline{) 21} (3$$

$$21$$

$$7 = \text{G. C. D.}$$

(3)

$$16082 \overline{) 25740} (1$$

$$\underline{16082}$$

$$9658 \overline{) 16082} (1$$

$$\underline{9658}$$

(4)

$$620 \overline{) 1116} (1$$

$$\underline{620}$$

$$496 \overline{) 620} (1$$

$$\underline{496}$$

$$124 \overline{) 496} (4$$

$$\underline{496}$$

$$124 \overline{) 1488} (12$$

$$\underline{124}$$

$$\underline{248}$$

$$\underline{248}$$

$$\dots$$

$$124 = \text{G. C. D.} = \text{Ans.}$$

$$6424 \overline{) 9658} (1$$

$$\underline{6424}$$

$$3234 \overline{) 6424} (1$$

$$\underline{3234}$$

$$3190 \overline{) 3234} (1$$

$$\underline{3190}$$

$$44 \overline{) 3190} (72$$

$$\underline{308}$$

$$\underline{110}$$

$$\underline{88}$$

$$22 \overline{) 44} (2$$

$$\underline{44}$$

$$\dots$$

$$22 = \text{G. C. D.} = \text{Ans.}$$

(5)

$$5270 \overline{) 5952} (1$$

$$\underline{5270}$$

$$682 \overline{) 5270} (7$$

$$\underline{4774}$$

$$496 \overline{) 682} (1$$

$$\underline{496}$$

$$186 \overline{) 496} (2$$

$$\underline{372}$$

$$124 \overline{) 186} (1$$

$$\underline{124}$$

$$62 \overline{) 124} (2$$

$$\underline{124}$$

$$\dots$$

$$62 \overline{) 3038} (49$$

$$\underline{248}$$

$$\underline{558}$$

$$\underline{558}$$

$$\dots$$

$$62 = \text{G. C. D.} = \text{Ans.}$$

$$\begin{array}{r}
 (6) \\
 4617 \overline{) 7695} (1 \\
 \underline{4617} \\
 3078 \overline{) 4617} (1 \\
 \underline{3078} \\
 1539 \overline{) 3078} (2 \\
 \underline{3078} \\
 \dots
 \end{array}
 \qquad
 \begin{array}{r}
 1539 \overline{) 6642} (4 \\
 \underline{6156} \\
 486 \overline{) 1539} (3 \\
 \underline{1458} \\
 81 \overline{) 486} (6 \\
 \underline{486} \\
 \dots
 \end{array}$$

$$\begin{array}{r}
 81 \overline{) 8424} (104 \\
 \underline{81} \\
 324 \\
 \underline{324} \\
 \dots
 \end{array}$$

81 = G. C. D. = *Ans.*

(7)

It is plain that the number of bushels in each load must be the greatest common divisor of 315 and 810. That divisor is 45. *Ans.*

(8)

The question is, what extent of ground is that which will be contained an exact number of times in the two tracts: what is their greatest common divisor? *Ans.* 25 acres.

(9)

There are 1004 feet on one street, and 744 on the other. The panels belong to each front, and hence, the length of of each must be the greatest common divisor of the two sides: viz., 12 feet. *Ans.*

(10)

The greatest common divisor of the three numbers will be the number of bushels to be put into each bag. That divisor is 3. *Ans.*

(11)

If each invests his whole money, the price of each cow must be a common divisor of the three amounts, \$286, \$462, and \$638: 2, 11, and 22 are common divisors, but only 22 will give the required number of cows, 63.

$286 \div 22 = 13$ , A bought;  $462 \div 22 = 21$ , B bought;  
 $638 \div 22 = 29$ , C bought. *Ans.*

## COMMON FRACTIONS.

(2)

$$\frac{15}{18}, \frac{37}{49}, \frac{24}{30}.$$

(3)

$$\frac{27}{40}, \frac{95}{40}, \frac{106}{40}, \frac{87}{40}, \frac{41}{40}.$$

(4)

$$\frac{45}{68}, \frac{56}{68}, \frac{85}{68}, \frac{95}{68}, \frac{37}{68}.$$

(5)

$$\frac{9}{90}, \frac{87}{90}, \frac{75}{90}, \frac{65}{90}.$$

(1)

$$\frac{3}{8} \times 6 = \frac{18}{8}, \quad \frac{3}{8} \times 7 = \frac{21}{8}.$$

(2)

$$\frac{7}{8} \times 4 = \frac{28}{8}, \quad \frac{7}{8} \times 9 = \frac{63}{8}.$$

(3)

$$\frac{5}{31} \times 11 = \frac{55}{31}, \quad \frac{5}{31} \times 12 = \frac{60}{31}.$$

(4)

$$\frac{7}{23} \times 12 = \frac{84}{23}, \quad \frac{7}{23} \times 14 = \frac{98}{23}.$$

(5)

$$\frac{47}{13} \times 3 = \frac{141}{13}, \quad \frac{47}{13} \times 4 = \frac{188}{13}.$$

(6)

$$\frac{14}{19} \times 7 = \frac{98}{19}, \quad \frac{14}{19} \times 9 = \frac{126}{19}.$$

(7)

$$\frac{47}{28} \times 5 = \frac{235}{28}, \quad \frac{47}{28} \times 10 = \frac{470}{28}.$$

(8)

$$\frac{27}{29} \times 3 = \frac{81}{29}, \quad \frac{27}{29} \times 11 = \frac{297}{29}.$$

(1)

$$\frac{17}{16} \times 8 = \frac{17}{16 \div 8} = \frac{17}{2}, \quad \frac{17}{16} \times 4 = \frac{17}{16 \div 4} = \frac{17}{4}, \quad \frac{17}{16} \times 2 = \frac{17}{16 \div 2} = \frac{17}{8}.$$

(2)

$$\frac{2}{24} \times 2 = \frac{2}{12}, \quad \frac{2}{24} \times 3 = \frac{2}{12}, \quad \frac{2}{24} \times 4 = \frac{2}{12}, \quad \frac{2}{24} \times 6 = \frac{2}{12}, \quad \frac{2}{24} \times 8 = \frac{2}{12}.$$

(3)

$$\frac{7}{30} \times 6 = \frac{7}{5}, \quad \frac{7}{30} \times 5 = \frac{7}{6}, \quad \frac{7}{30} \times 10 = \frac{7}{3}, \quad \frac{7}{30} \times 15 = \frac{7}{2} \text{ Ans.}$$

(4)

$$\frac{17}{18} \times 2 = \frac{17}{9}, \quad \frac{17}{18} \times 3 = \frac{17}{6}, \quad \frac{17}{18} \times 4 = \frac{17}{9}, \quad \frac{17}{18} \times 6 = \frac{17}{3},$$

$$\frac{17}{18} \times 8 = \frac{17}{9} \text{ Ans.}$$

(5)

$$\frac{6}{40} \times 4 = \frac{6}{10}, \quad \frac{6}{40} \times 5 = \frac{6}{8}, \quad \frac{6}{40} \times 10 = \frac{6}{4}, \quad \frac{6}{40} \times 20 = \frac{6}{2}.$$

(6)

$$\frac{7}{35} \times 7 = \frac{7}{5}, \quad \frac{7}{35} \times 5 = \frac{7}{7} \text{ Ans.}$$

(7)

$$\frac{6}{42} \times 21 = \frac{6}{2}, \quad \frac{6}{42} \times 6 = \frac{6}{7}, \quad \frac{6}{42} \times 7 = \frac{6}{6}, \quad \frac{6}{42} \times 3 = \frac{6}{14}, \quad \frac{6}{42} \times 2 = \frac{6}{21}.$$

(8)

$$\frac{12}{36} \times 3 = \frac{12}{12}, \quad \frac{12}{36} \times 4 = \frac{12}{9}, \quad \frac{12}{36} \times 6 = \frac{12}{6}, \quad \frac{12}{36} \times 9 = \frac{12}{4},$$

$$\frac{12}{36} \times 12 = \frac{12}{3} \text{ Ans.}$$

(1)

$$\frac{16}{18} \div 2 = \frac{8}{9}, \quad \frac{16}{18} \div 4 = \frac{4}{9}, \quad \frac{16}{18} \div 8 = \frac{2}{9}, \quad \frac{16}{18} \div 16 = \frac{1}{9} \text{ Ans.}$$

(2)

$$\frac{14}{14} \div 2 = \frac{7}{7}, \quad \frac{14}{14} \div 7 = \frac{2}{7}, \quad \frac{14}{14} \div 14 = \frac{1}{7} \text{ Ans.}$$

(3)

$$\frac{20}{18} \div 2 = \frac{10}{9}, \quad \frac{20}{18} \div 5 = \frac{4}{9}, \quad \frac{20}{18} \div 4 = \frac{5}{9}, \quad \frac{20}{18} \div 10 = \frac{2}{9} \text{ Ans.}$$



(4)

$$\frac{60}{28} \div 5 = \frac{12}{28}, \quad \frac{60}{28} \div 6 = \frac{10}{28}, \quad \frac{60}{28} \div 10 = \frac{6}{28}, \quad \frac{60}{28} \div 15 = \frac{4}{28},$$

$$\frac{60}{28} \div 20 = \frac{3}{28}. \text{ Ans.}$$

(5)

$$\frac{18}{19} \div 2 = \frac{9}{19}, \quad \frac{18}{19} \div 3 = \frac{6}{19}, \quad \frac{18}{19} \div 6 = \frac{3}{19}, \quad \frac{18}{19} \div 9 = \frac{2}{19}. \text{ Ans.}$$

(6)

$$\frac{24}{25} \div 3 = \frac{8}{25}, \quad \frac{24}{25} \div 6 = \frac{4}{25}, \quad \frac{24}{25} \div 8 = \frac{3}{25}, \quad \frac{24}{25} \div 12 = \frac{2}{25}. \text{ Ans.}$$

(7)

$$\frac{27}{29} \div 3 = \frac{9}{29}, \quad \frac{27}{29} \div 9 = \frac{3}{29}, \quad \frac{27}{29} \div 27 = \frac{1}{29}. \text{ Ans.}$$

(8)

$$\frac{54}{59} \div 6 = \frac{9}{59}, \quad \frac{54}{59} \div 9 = \frac{6}{59}, \quad \frac{54}{59} \div 27 = \frac{2}{59}, \quad \frac{54}{59} \div 54 = \frac{1}{59}. \text{ Ans.}$$

(1)

$$\frac{3}{4} \div 6 = \frac{3}{4 \times 6} = \frac{3}{24}, \quad \frac{3}{4} \div 7 = \frac{3}{4 \times 7} = \frac{3}{28}, \quad \frac{3}{4} \div 8 = \frac{3}{4 \times 8} = \frac{3}{32}. \text{ Ans.}$$

(2)

$$\frac{4}{9} \div 5 = \frac{4}{45}, \quad \frac{4}{9} \div 4 = \frac{4}{36}, \quad \frac{4}{9} \div 9 = \frac{4}{81}. \text{ Ans.}$$

(3)

$$\frac{14}{17} \div 3 = \frac{14}{51}, \quad \frac{14}{17} \div 4 = \frac{14}{68}, \quad \frac{14}{17} \div 12 = \frac{14}{204}. \text{ Ans.}$$

(4)

$$\frac{30}{47} \div 6 = \frac{30}{282}, \quad \frac{30}{47} \div 8 = \frac{30}{376}, \quad \frac{30}{47} \div 11 = \frac{30}{517}. \text{ Ans.}$$

(5)

$$\frac{15}{17} \div 7 = \frac{15}{119}, \quad \frac{15}{17} \div 5 = \frac{15}{85}, \quad \frac{15}{17} \div 3 = \frac{15}{51}. \text{ Ans.}$$

(6)

$$\frac{14}{17} \div 7 = \frac{14}{119}, \quad \frac{14}{17} \div 8 = \frac{14}{136}, \quad \frac{14}{17} \div 6 = \frac{14}{102}. \text{ Ans.}$$

(7)

$$\frac{25}{19} \div 3 = \frac{25}{57}, \quad \frac{25}{19} \div 7 = \frac{25}{133}, \quad \frac{25}{19} \div 11 = \frac{25}{209}. \text{ Ans.}$$

(8)

$$\frac{11}{15} \div 8 = \frac{11}{120}, \quad \frac{11}{15} \div 4 = \frac{11}{60}, \quad \frac{11}{15} \div 10 = \frac{11}{150}. \text{ Ans.}$$

(1)

$$\frac{7}{8} = \frac{7 \times 4}{8 \times 4} = \frac{28}{32}, \quad \frac{7 \times 7}{8 \times 6} = \frac{49}{48}, \quad \frac{7 \times 5}{8 \times 5} = \frac{35}{40}. \text{ Ans.}$$

(2)

$$\frac{8 \times 5}{11 \times 5} = \frac{40}{55}, \quad \frac{8 \times 8}{11 \times 8} = \frac{64}{88}, \quad \frac{8 \times 9}{11 \times 9} = \frac{72}{99}, \quad \frac{8 \times 11}{11 \times 11} = \frac{88}{121}.$$

(3)

$$\frac{16 \times 7}{19 \times 7} = \frac{112}{133}, \quad \frac{16 \times 8}{19 \times 8} = \frac{128}{152}, \quad \frac{16 \times 9}{19 \times 9} = \frac{144}{171}. \text{ Ans.}$$

(4)

$$\frac{14 \times 5}{29 \times 5} = \frac{70}{145}, \quad \frac{14 \times 8}{29 \times 8} = \frac{112}{232}, \quad \frac{14 \times 6}{29 \times 6} = \frac{84}{174}, \quad \frac{14 \times 12}{29 \times 12} = \frac{168}{348}.$$

(5)

$$\frac{23 \times 2}{25 \times 2} = \frac{46}{50}, \quad \frac{23 \times 3}{25 \times 3} = \frac{69}{75}, \quad \frac{23 \times 4}{25 \times 4} = \frac{92}{100}, \quad \frac{23 \times 5}{25 \times 5} = \frac{115}{125}.$$

(1)

$$\frac{4 \div 2}{8 \div 2} = \frac{2}{4}, \quad \frac{4 \div 4}{8 \div 4} = \frac{1}{2}.$$

(2)

$$\frac{3 \div 3}{6 \div 3} = \frac{1}{2}.$$

(3)

$$\frac{24 \div 2}{36 \div 2} = \frac{12}{18}, \quad \frac{24 \div 3}{36 \div 3} = \frac{8}{12}, \quad \frac{24 \div 4}{36 \div 4} = \frac{6}{9}, \quad \frac{24 \div 6}{36 \div 6} = \frac{4}{6}, \quad \frac{24 \div 12}{36 \div 12} = \frac{2}{3}.$$

(4)

$$\frac{48 \div 2}{64 \div 2} = \frac{24}{32}, \quad \frac{48 \div 4}{64 \div 4} = \frac{12}{16}, \quad \frac{48 \div 8}{64 \div 8} = \frac{6}{8}, \quad \frac{48 \div 16}{64 \div 16} = \frac{3}{4}.$$

(5)

$$\frac{72 \div 2}{96 \div 2} = \frac{36}{48}, \quad \frac{72 \div 3}{96 \div 3} = \frac{24}{32}, \quad \frac{72 \div 4}{96 \div 4} = \frac{18}{24}, \quad \frac{72 \div 6}{96 \div 6} = \frac{12}{16}, \quad \frac{72 \div 12}{96 \div 12} = \frac{6}{8}.$$

(6)

$$\frac{36 \div 2}{144 \div 2} = \frac{18}{72}, \quad \frac{36 \div 3}{144 \div 3} = \frac{12}{48}, \quad \frac{36 \div 4}{144 \div 4} = \frac{9}{36}, \quad \frac{36 \div 6}{144 \div 6} = \frac{6}{24}, \quad \frac{36 \div 36}{144 \div 36} = \frac{1}{4}.$$

## REDUCTION OF FRACTIONS.

(1)

$$\frac{18 \times 7}{7} = \frac{126}{7}.$$

(2)

$$\frac{25 \times 12}{12} = \frac{300}{12}.$$

(3)

$$\frac{12 \times 8}{8} = \frac{152}{8}.$$

(4)

$$\frac{29 \times 14}{14} = \frac{406}{14}.$$

(5)

$$\frac{65 \times 37}{37} = \frac{2405}{37}.$$

(6)

$$\frac{145 \times 9}{9} = \frac{1305}{9}.$$

(7)

$$\frac{450 \times 12}{12} = \frac{5400}{12}.$$

(8)

$$\frac{327 \times 36}{36} = \frac{11772}{36}.$$

(9)

$$\frac{97 \times 128}{128} = \frac{12416}{128}.$$

(10)

$$\frac{167 \times 89}{89} = \frac{14863}{89}.$$

(11)

$$\frac{325 \times 75}{75} = \frac{24375}{75}.$$

(1)

$$\frac{397}{8} = \frac{319}{8}.$$

$$\begin{array}{r} 319 \\ \hline 8 \end{array}$$

(2)

$$\frac{1129}{10} = \frac{1129}{10}.$$

$$\begin{array}{r} 1129 \\ \hline 10 \end{array}$$

(3)

$$\frac{42711}{24} = \frac{10259}{24}.$$

$$\begin{array}{r} 10259 \\ \hline 24 \end{array}$$

(4)

$$\frac{67637}{51} = \frac{34513}{51}.$$

$$\begin{array}{r} 34513 \\ \hline 51 \end{array}$$

(5)

$$\frac{3679}{104} = \frac{38177}{104}.$$

$$\begin{array}{r} 38177 \\ \hline 104 \end{array}$$

(6)

$$\frac{84736}{175} = \frac{148261}{175}.$$

$$\begin{array}{r} 148261 \\ \hline 175 \end{array}$$

(7)

$$\begin{array}{r} 67426258 = 59267822. \\ 879 \\ \hline 59267822 \\ \hline 879 \end{array}$$

(8)

$$\begin{array}{r} 675187 = 135187. \\ 200 \\ \hline 135187 \\ \hline 200 \end{array}$$

(9)

$$\begin{array}{r} 18741 = 28278. \\ 151 \\ \hline 28278 \\ \hline 151 \end{array}$$

(10)

$$\begin{array}{r} 1498 = 1346. \\ 9 \\ \hline 1346 \\ \hline 9 \end{array}$$

(11)

$$\begin{array}{r} 37524 = 37219. \\ 99 \\ \hline 37219 \\ \hline 99 \end{array}$$

(12)

$$\begin{array}{r} 17494548 = 1749383049. \\ 99999 \\ \hline 1749383049 \\ \hline 99999 \end{array}$$

(13)

$$\begin{array}{r} 483457 = 459287. \\ 95 \\ \hline 459287 \\ \hline 95 \end{array}$$

(14)

$$\begin{array}{r} 17898 = 16106. \\ 9 \\ \hline 16106 \\ \hline 9 \end{array}$$

(15)

$$\begin{array}{r} 1254 = 881. \\ 7 \\ \hline 881 \\ \hline 7 \end{array}$$

(16)

$$\begin{array}{r} 3753 = 1503. \\ 4 \\ \hline 1503 \\ \hline 4 \end{array}$$

(17)

$$\begin{array}{r} 46418 = 29251. \\ 63 \\ \hline 29251 \\ \hline 63 \end{array}$$

(18)

$$\begin{array}{r} 9611 = 61451. \\ 640 \\ \hline 61451 \\ \hline 640 \end{array}$$

(19)

$$\begin{array}{r} 98441 = 110249. \\ 112 \\ \hline 110249 \\ \hline 112 \end{array}$$

$$\begin{array}{r}
 (20) \quad 35 \overline{) 12882} = 366 \frac{2}{3} \\
 \underline{366} \\
 12882 \\
 \underline{366} \\
 366
 \end{array}
 \quad
 \begin{array}{r}
 (21) \quad 87 \overline{) 11786} = 135 \frac{1}{3} \\
 \underline{135} \\
 11786 \\
 \underline{135} \\
 135
 \end{array}
 \quad
 \begin{array}{r}
 (22) \quad 77 \overline{) 78} = 1 \frac{1}{7} \\
 \underline{77} \\
 1
 \end{array}
 \quad
 \begin{array}{r}
 (23) \quad 333 \overline{) 334} = 1 \frac{1}{3} \\
 \underline{333} \\
 1
 \end{array}$$

$$\begin{array}{r}
 (1) \quad 108 \overline{) 108} = 1 \\
 \underline{108} \\
 0
 \end{array}
 \quad
 \begin{array}{r}
 (2) \quad 576 \overline{) 576} = 12 \\
 \underline{576} \\
 0
 \end{array}
 \quad
 \begin{array}{r}
 (3) \quad 1764 \overline{) 1764} = 1 \\
 \underline{1764} \\
 0
 \end{array}$$

$$\begin{array}{r}
 (4) \quad 19900 \overline{) 19900} = 1 \\
 \underline{19900} \\
 0
 \end{array}
 \quad
 \begin{array}{r}
 (5) \quad 135 \overline{) 135} = 1 \\
 \underline{135} \\
 0
 \end{array}
 \quad
 \begin{array}{r}
 (6) \quad 2358 \overline{) 2358} = 1 \\
 \underline{2358} \\
 0
 \end{array}$$

$$\begin{array}{r}
 (7) \quad 6284 \overline{) 6284} = 1 \\
 \underline{6284} \\
 0
 \end{array}
 \quad
 \begin{array}{r}
 (8) \quad 4976 \overline{) 4976} = 1 \\
 \underline{4976} \\
 0
 \end{array}$$

$$\begin{array}{r}
 (9) \quad 102409 \overline{) 102409} = 1 \\
 \underline{102409} \\
 0
 \end{array}
 \quad
 \begin{array}{r}
 (10) \quad 4478 \overline{) 4478} = 1 \\
 \underline{4478} \\
 0
 \end{array}$$

$$\begin{array}{r}
 (11) \quad 17959 \overline{) 17959} = 1 \\
 \underline{17959} \\
 0
 \end{array}
 \quad
 \begin{array}{r}
 (12) \quad 526950 \overline{) 526950} = 1 \\
 \underline{526950} \\
 0
 \end{array}$$

$$\begin{array}{r} (13) \\ 4790 \\ \underline{25} \phantom{00} 4790 = 191\frac{1}{2}. \\ 191\frac{1}{2} \end{array}$$

$$\begin{array}{r} (14) \\ 1512 \\ \underline{108} \phantom{00} 1512 = 14. \\ 14 \end{array}$$

$$\begin{array}{r} (15) \\ 375941 \\ \underline{999} \phantom{00} 375941 = 376\frac{317}{999}. \\ 376\frac{317}{999} \end{array}$$

$$\begin{array}{r} (16) \\ 3745174 \\ \underline{349} \phantom{00} 3745174 = 10731\frac{55}{349}. \\ 10731\frac{55}{349} \end{array}$$

$$\begin{array}{r} (1) \\ 7 \div 7 \\ \underline{49} \div 7 = \frac{1}{7} \text{ Ans.} \end{array}$$

$$\begin{array}{r} (2) \\ 84 \div 12 \\ \underline{420} \div 12 = \frac{7}{35} \div 7 = \frac{1}{5} \text{ Ans.} \end{array}$$

$$\begin{array}{r} (3) \\ 104 \div 8 \\ \underline{312} \div 8 = \frac{13}{39} \div 13 = \frac{1}{3} \text{ Ans.} \end{array}$$

$$\begin{array}{r} (4) \\ 1049 \div 1049 \\ \underline{8392} \div 1049 = \frac{1}{8} \text{ Ans.} \end{array}$$

$$\begin{array}{r} (5) \\ 275 \div 5 \\ \underline{440} \div 5 = \frac{55}{88} \div 11 = \frac{5}{8} \text{ Ans.} \end{array}$$

$$\begin{array}{r} (6) \\ 351 \div 3 \\ \underline{795} \div 3 = \frac{117}{268} \text{ Ans.} \end{array}$$

$$\begin{array}{r} (7) \\ 172 \div 2 \\ \underline{1118} \div 2 = \frac{86}{559} \div 43 = \frac{2}{13} \text{ Ans.} \end{array}$$

(8)  
The greatest common divisor of 63 and 81 is 9.

$$\begin{array}{r} 63 \div 9 \\ \underline{81} \div 9 = \frac{7}{9} \text{ Ans.} \end{array}$$

(9)  
The greatest common divisor of 315 and 405 is 45.

$$\begin{array}{r} 315 \div 45 \\ \underline{405} \div 45 = \frac{7}{9} \text{ Ans.} \end{array}$$

(10)

The greatest common divisor of 1157 and 623 is 89

$$\frac{1157}{623} \div 89 = \frac{13}{7} = 1\frac{6}{7} \text{ Ans.}$$

(11)

The greatest common divisor of 792 and 1386 is 198.

$$\frac{792}{1386} \div 198 = \frac{4}{7} \text{ Ans.}$$

(12)

G. C. D. = 2.

$$\frac{374}{1030} \div 2 = \frac{187}{515}$$

(13)

G. C. D. = 10.

$$\frac{410}{510} \div 10 = \frac{41}{51} \text{ Ans.}$$

(14)

G. C. D. = 5.

$$\frac{345}{1745} \div 5 = \frac{69}{349} \text{ Ans.}$$

(15)

G. C. D. = 27.

$$\frac{8343}{9747} \div 27 = \frac{309}{361} \text{ Ans.}$$

(16)

G. C. D. = 3.

$$\frac{549}{7143} \div 3 = \frac{183}{2381} \text{ Ans.}$$

(17)

G. C. D. = 180.

$$\frac{2160}{2340} \div 180 = \frac{12}{13} \text{ Ans.}$$

(18)

G. C. D. = 63.

$$\frac{315}{1512} \div 63 = \frac{5}{24} \text{ Ans.}$$

(19)

G. C. D. = 960.

$$\frac{10560}{35520} \div 960 = \frac{11}{33} \text{ Ans}$$

(20)

G. C. D. = 288.

$$\frac{6048}{38592} \div 288 = \frac{21}{134}$$

(21)

G. C. D. = 864.

$$\frac{864}{21600} \div 864 = \frac{1}{25}$$

(22)

G. C. D. = 540.

$$\frac{1080}{66420} \div 540 = \frac{2}{113}$$

## WITHOUT CANCELLATION.

(1)

$$\frac{3}{4} \text{ of } \frac{5}{6} \text{ of } \frac{2}{3} = \frac{3 \times 5 \times 2}{4 \times 6 \times 3} = \frac{30}{72} = \frac{5}{12} \text{ Ans.}$$

(2)

$$\frac{2}{5} \text{ of } \frac{7}{9} \text{ of } \frac{3}{4} = \frac{2 \times 7 \times 3}{5 \times 9 \times 4} = \frac{42}{180} = \frac{7}{30} \text{ Ans.}$$

## BY CANCELLATION.

(3)

$$\frac{2}{3} \text{ of } \frac{3}{7} \text{ of } \frac{9}{\cancel{4}_2} = \frac{2}{14} \text{ Ans.}$$

(4)

$$\frac{2}{9} \text{ of } \frac{3}{5} \text{ of } \frac{5}{\cancel{8}_2} \text{ of } \frac{\cancel{10}^5}{3} = \frac{5}{18} \text{ Ans.}$$

(5)

$$\frac{3}{\cancel{10}_2} \text{ of } \frac{2}{3} \text{ of } \frac{7}{8} \text{ of } \frac{5}{\cancel{44}_2} = \frac{3}{16}$$

(6)

$$\frac{1}{4} \text{ of } \frac{1}{2} \text{ of } \frac{3}{4} \text{ of } \frac{25}{2} = \frac{75}{64} = 1\frac{11}{64}$$

(7)

$$\frac{2}{7} \text{ of } \frac{5}{6} \text{ of } \frac{\cancel{21}^1}{\cancel{5}_1} = 1 \text{ Ans.}$$

(8)

$$\frac{3}{\cancel{10}_2} \text{ of } \frac{11}{\cancel{22}_2} \text{ of } \frac{13}{\cancel{44}_4} = \frac{143}{4} = 35\frac{3}{4}$$



(9)

$$\frac{7}{8} \text{ of } \frac{28}{3} \text{ of } \frac{14}{7} \text{ of } \frac{14}{5} = \frac{147}{1} = 147 \text{ Ans.}$$

(10)

$$\frac{6}{14} \text{ of } \frac{7}{12} \text{ of } \frac{49}{9} = \frac{49}{6} = 8\frac{1}{6} \text{ Ans.}$$

(11)

$$\frac{3}{4} \text{ of } \frac{5}{6} \text{ of } \frac{5}{9} \text{ of } \frac{27}{100} \text{ of } \frac{5}{13} = \frac{15}{116} \text{ Ans.}$$

(12)

$$\frac{41}{110} \text{ of } \frac{3}{19} \text{ of } \frac{57}{108} \text{ of } \frac{3}{7} = \frac{41}{3080} \text{ Ans.}$$

(13)

$$\frac{29}{8} \text{ of } \frac{5}{7} \text{ of } \frac{32}{301} \text{ of } \frac{7}{1} = \frac{580}{43} = 13\frac{1}{43} \text{ Ans.}$$

(1)

$$\frac{3}{4}, 5\frac{1}{2} = \frac{16}{3}, \frac{6}{7} = \frac{63}{84}, \frac{448}{84}, \frac{72}{84} \text{ Ans.}$$

$$3 \times 3 \times 7 = 63 \text{ 1st numerator.}$$

$$16 \times 4 \times 7 = 448 \text{ 2d "}$$

$$6 \times 4 \times 3 = 72 \text{ 3d "}$$

$$4 \times 3 \times 7 = 84 \text{ com. denom.}$$

(2)

$$\frac{3}{2}, \frac{2}{3}, \frac{1}{7}, \frac{5}{2} = \frac{126}{210}, \frac{140}{210}, \frac{30}{210}, \frac{525}{210} \text{ Ans.}$$

$$3 \times 3 \times 7 \times 2 = 126 \text{ 1st numerator.}$$

$$2 \times 5 \times 7 \times 2 = 140 \text{ 2d "}$$

$$1 \times 5 \times 3 \times 2 = 30 \text{ 3d "}$$

$$5 \times 5 \times 3 \times 7 = 525 \text{ 4th "}$$

$$5 \times 3 \times 7 \times 2 = 210 \text{ com. denom.}$$

(3)

$$\frac{19}{2}, \frac{13}{3}, \frac{11}{4}, \frac{4}{5} = \frac{1140}{120}, \frac{520}{120}, \frac{330}{120}, \frac{96}{120} \text{ Ans.}$$

$$19 \times 3 \times 4 \times 5 = 1140 \text{ 1st numerator.}$$

$$13 \times 2 \times 4 \times 5 = 520 \text{ 2d "}$$

$$11 \times 2 \times 3 \times 5 = 330 \text{ 3d "}$$

$$4 \times 2 \times 3 \times 4 = 96 \text{ 4th "}$$

$$2 \times 3 \times 4 \times 5 = 120 \text{ com. denom.}$$

(4)

$$\frac{2}{3} = \frac{2 \times 8}{3 \times 8} = \frac{16}{24}, \quad \frac{7}{8} = \frac{7 \times 3}{8 \times 3} = \frac{21}{24},$$

$$\frac{5}{6} = \frac{5 \times 4}{6 \times 4} = \frac{20}{24}, \quad \frac{1}{2} = \frac{1 \times 12}{2 \times 12} = \frac{12}{24}, \quad \frac{9}{4} = \frac{9 \times 6}{4 \times 6} = \frac{54}{24}.$$

(5)

$$2\frac{1}{2} \text{ of } 3 = \frac{5}{2} \text{ of } 3 = \frac{15}{2}$$

$$\frac{15}{2}, \frac{6}{7}, \frac{4}{9}, \frac{3}{5} = \frac{4725}{630}, \frac{540}{630}, \frac{280}{630}, \frac{378}{630}.$$

$$15 \times 7 \times 9 \times 5 = 4725 \text{ 1st numerator.}$$

$$6 \times 2 \times 9 \times 5 = 540 \text{ 2d "}$$

$$4 \times 2 \times 7 \times 5 = 280 \text{ 3d "}$$

$$3 \times 2 \times 7 \times 9 = 378 \text{ 4th "}$$

$$2 \times 7 \times 9 \times 5 = 630 \text{ com. donom.}$$

(6)

$$2\frac{1}{2} \text{ of } 3\frac{1}{2} = \frac{5}{2} \text{ of } 2\frac{3}{7} = \frac{110}{14}$$

$$\frac{110}{14}, \frac{42}{7} = \frac{990}{126}, \frac{588}{126}$$

$$110 \times 9 = 990 \text{ 1st numerator.}$$

$$42 \times 14 = 588 \text{ 2d} \quad "$$

$$14 \times 9 = 126 \text{ com. denom.}$$

(7)

$$\frac{6}{21}, \frac{34}{7} = \frac{30}{105}, \frac{714}{105}$$

$$6 \times 5 = 30 \text{ 1st numerator.}$$

$$34 \times 21 = 714 \text{ 2d} \quad "$$

$$21 \times 5 = 105 \text{ com. denom.}$$

(8)

$$\frac{44}{9}, \frac{7}{3}, \frac{11}{2}, \frac{6}{1} = \frac{88}{18}, \frac{42}{18}, \frac{99}{18}, \frac{108}{18}$$

(9)

$$\frac{26}{5}, \frac{6}{5}, \frac{7}{2}, \frac{11}{3} = \frac{156}{30}, \frac{36}{30}, \frac{105}{30}, \frac{110}{30}$$

(10)

$$\frac{3}{4} \text{ of } 5\frac{1}{2} = \frac{3}{4} \text{ of } \frac{11}{2} = \frac{33}{8}$$

$$1, \frac{24}{8} = \frac{20}{8}, \frac{24}{8}$$

(11)

$$4\frac{1}{2} \text{ of } 3\frac{1}{2} = \frac{13}{2} \text{ of } \frac{7}{2} = \frac{91}{2}$$

$$\frac{91}{2}, \frac{42}{2} = \frac{637}{12}, \frac{324}{12}$$

$$91 \times 7 = 637 \text{ 1st numerator.}$$

$$54 \times 6 = 324 \text{ 2d} \quad "$$

$$6 \times 7 = 42 \text{ com. denom.}$$

(12)

$$\frac{28}{3}, \frac{3}{7}, \frac{43}{7}, \frac{1}{3} = \frac{266}{21}, \frac{9}{21}, \frac{129}{21}, \frac{7}{21}$$

(1)

$$\frac{3}{4} \times \frac{3}{3} = \frac{9}{12}; \frac{7}{12}; \frac{1}{2} \times \frac{6}{6} = \frac{6}{12}; \frac{5}{6} \times \frac{2}{2} = \frac{10}{12}$$

(2)

$$\frac{6}{7} \times \frac{3}{3} = \frac{18}{21}; \frac{8}{21}; \frac{2}{3} \times \frac{7}{7} = \frac{14}{21}$$

(3)

$$\frac{21}{5} \times 4 = \frac{84}{5}; \frac{9}{10} \times 2 = \frac{18}{10}; \frac{29}{4} \times 5 = \frac{145}{4}.$$

(4)

$$\frac{95}{9} \times 2 = \frac{190}{9}; \frac{5}{6} \times 3 = \frac{15}{6}; \frac{22}{3} \times 6 = \frac{132}{3}.$$

(5)

$$\frac{81}{5} \times 6 = \frac{186}{5}; \frac{5}{6} \times 5 = \frac{25}{6}; \frac{22}{3} \times 10 = \frac{220}{3}.$$

(6)

$$\frac{4 \times 8}{5 \times 8} = \frac{32}{40}; \frac{7 \times 5}{8 \times 5} = \frac{35}{40}; \frac{29 \times 20}{2 \times 20} = \frac{580}{40}; \frac{15 \times 10}{4 \times 10} = \frac{150}{40}.$$

(7)

$$\frac{7 \times 6}{12 \times 6} = \frac{42}{72}; \frac{8 \times 8}{9 \times 8} = \frac{64}{72}; \frac{17 \times 12}{6 \times 12} = \frac{204}{72}; \frac{11 \times 9}{8 \times 9} = \frac{99}{72}.$$

(8)

$$\frac{6 \times 6}{7 \times 6} = \frac{36}{42}; \frac{1 \times 7}{6 \times 7} = \frac{7}{42}; \frac{16 \times 2}{21 \times 2} = \frac{32}{42}; \frac{2 \times 14}{3 \times 14} = \frac{28}{42}.$$

(9)

$$\frac{9 \times 4}{11 \times 4} = \frac{36}{44}; \frac{3 \times 11}{4 \times 11} = \frac{33}{44}; \frac{19 \times 2}{22 \times 2} = \frac{38}{44}; \frac{1 \times 22}{2 \times 22} = \frac{22}{44}.$$

(10)

$$\frac{5 \times 30}{2 \times 30} = \frac{150}{60}; \frac{31 \times 10}{6 \times 10} = \frac{310}{60}; \frac{9 \times 6}{10 \times 6} = \frac{54}{60}; \frac{53 \times 5}{12 \times 5} = \frac{265}{60}.$$

(1)

$$\frac{3}{8}, \frac{4}{7}, \frac{5}{12} = \frac{63}{168}, \frac{96}{168}, \frac{70}{168}.$$

168 = least com. mul. or denom.

$$168 \div 8 = 21; \quad 21 \times 3 = 63 = \text{1st numerator.}$$

$$168 \div 7 = 24; \quad 24 \times 4 = 96 = 2d \quad "$$

$$168 \div 12 = 14; \quad 14 \times 5 = 70 = 3d \quad "$$

(2)

$$\frac{5}{14}, \frac{3}{7}, \frac{16}{21} = \frac{15}{42}, \frac{18}{42}, \frac{32}{42}.$$

42 = least com. denom.

$$42 \div 14 = 3; \quad 3 \times 5 = 15 = \text{1st numerator.}$$

$$42 \div 7 = 6; \quad 6 \times 3 = 18 = 2d \quad "$$

$$42 \div 21 = 2; \quad 2 \times 16 = 32 = 3d \quad "$$

(3)

$$2\frac{3}{4} = \frac{11}{4}, \frac{5}{16}, \frac{9}{32} = \frac{88}{32}, \frac{10}{32}, \frac{9}{32}$$

32 = least com. denom.

$$32 \div 4 = 8; \quad 8 \times 11 = 88 \text{ 1st numerator.}$$

$$32 \div 16 = 2; \quad 2 \times 5 = 10 \text{ 2d} \quad "$$

$$32 \div 32 = 1; \quad 1 \times 9 = 9 \text{ 3d} \quad "$$

(4)

$$5\frac{3}{8} = \frac{43}{8}, 4\frac{5}{12} = \frac{53}{12}, \frac{7}{24} = \frac{129}{24}, \frac{106}{24}, \frac{7}{24}$$

24 = least com. denom.

$$24 \div 8 = 3; \quad 3 \times 43 = 129 = \text{1st numerator.}$$

$$24 \div 12 = 2; \quad 2 \times 53 = 106 = 2d \quad "$$

$$24 \div 24 = 1; \quad 1 \times 7 = 7 = 3d \quad "$$

(5)

$$8\frac{7}{15} = \frac{127}{15}, \frac{2}{5}, \frac{7}{30} = \frac{254}{30}, \frac{12}{30}, \frac{7}{30}$$

30 = least com. denom.

$$30 \div 15 = 2; \quad 2 \times 127 = 254 = \text{1st numerator.}$$

$$30 \div 5 = 6; \quad 6 \times 2 = 12 = 2d \quad "$$

$$30 \div 30 = 1; \quad 1 \times 7 = 7 = 3d \quad "$$

(6)

$$9\frac{8}{11} = \frac{107}{11}, \frac{3}{22}, \frac{5}{33} = \frac{642}{66}, \frac{9}{66}, \frac{10}{66}$$

66 = least com. denom.

$$66 \div 11 = 6; 6 \times 107 = 642 = \text{1st numerator.}$$

$$66 \div 22 = 3; 3 \times 3 = 9 = 2d \quad "$$

$$66 \div 33 = 2; 2 \times 5 = 10 = 3d \quad "$$

(7)

$$2\frac{1}{2} = \frac{5}{2}, 3\frac{5}{2} = \frac{68}{2} = \frac{1}{14}, \frac{195}{42}, \frac{136}{42}, \frac{3}{42}$$

42 = least com. denom.

$$42 \div 2 = 21; 21 \times 5 = 105 = \text{1st numerator.}$$

$$42 \div 21 = 2; 2 \times 68 = 136 = 2d \quad "$$

$$42 \div 14 = 3; 3 \times 1 = 3 = 3d \quad "$$

(8)

$$3\frac{5}{12} = \frac{41}{12}, \frac{7}{6}, \frac{3}{8}, \frac{9}{16} = \frac{164}{48}, \frac{56}{48}, \frac{18}{48}, \frac{27}{48}$$

48 = least com. denom.

$$48 \div 12 = 4; 4 \times 41 = 164 = \text{1st numerator.}$$

$$48 \div 6 = 8; 8 \times 7 = 56 = 2d \quad "$$

$$48 \div 8 = 6; 6 \times 3 = 18 = 3d \quad "$$

$$48 \div 16 = 3; 3 \times 9 = 27 = 4th \quad "$$

(9)

$$\frac{8}{9}, \frac{5}{27}, \frac{7}{36} = \frac{96}{108}, \frac{20}{108}, \frac{21}{108}$$

108 = least com. denom.

$$108 \div 9 = 12; 12 \times 8 = 96 = \text{1st numerator.}$$

$$108 \div 27 = 4; 4 \times 5 = 20 = 2d \quad "$$

$$108 \div 36 = 3; 3 \times 7 = 21 = 3d \quad "$$

(10)

$$4\frac{6}{13} = \frac{52}{13}, 7\frac{3}{26} = \frac{183}{26}, \frac{5}{39} = \frac{348}{39}, \frac{555}{39}, \frac{10}{39}$$

78 = least com. denom.

$$78 \div 13 = 6; 6 \times 52 = 312 = \text{1st numerator.}$$

$$78 \div 26 = 3; 3 \times 183 = 555 = 2d \quad "$$

$$78 \div 39 = 2; 2 \times 5 = 10 = 3d \quad "$$

(11)

$$6\frac{7}{8} = \frac{52}{8}, 8\frac{7}{10} = \frac{87}{10}, 2\frac{9}{20} = \frac{49}{20} = \frac{128}{20}, \frac{174}{20}, \frac{49}{20}$$

20 = least com. denom.

$$20 \div 5 = 4; 4 \times 32 = 128 = \text{1st numerator.}$$

$$20 \div 10 = 2; 2 \times 87 = 174 = 2d \quad "$$

$$20 \div 20 = 1; 1 \times 49 = 49 = 3d \quad "$$

(12)

$$\frac{9}{17}, 2\frac{3}{34} = \frac{71}{34}, 1\frac{5}{68} = \frac{73}{68} = \frac{36}{68}, \frac{142}{68}, \frac{63}{68}$$

68 = least com. denom.

$$68 \div 17 = 4; 4 \times 9 = 36 = \text{1st numerator.}$$

$$68 \div 34 = 2; 2 \times 71 = 142 = 2d \quad "$$

$$68 \div 68 = 1; 1 \times 73 = 73 = 3d \quad "$$

(13)

$$5\frac{7}{9} = \frac{52}{9}, 6\frac{5}{18} = \frac{113}{18}, \frac{7}{36}, \frac{1}{72} = \frac{416}{72}, \frac{452}{72}, \frac{14}{72}, \frac{1}{72}$$

72 = least com. denom.

$$72 \div 9 = 8; 8 \times 52 = 416 = \text{1st numerator.}$$

$$72 \div 18 = 4; 4 \times 113 = 452 = 2d \quad "$$

$$72 \div 36 = 2; 2 \times 7 = 14 = 3d \quad "$$

$$72 \div 72 = 1; 1 \times 1 = 1 = 4th \quad "$$

## DENOMINATE FRACTIONS.

(1)

$$\frac{23}{4} = \frac{3}{4} \times \frac{20}{1} \times \frac{12}{1} \times \frac{4}{1} = 7\frac{1}{4} \text{ far.}$$

(2)

$$\frac{5}{6} \text{ ton} = \frac{5}{6} \times \frac{10}{1} \times \frac{4}{1} \times \frac{25}{1} = \frac{5000}{3} = 1666\frac{2}{3} \text{ lb.}$$

(3)

$$\frac{7}{9} \text{ wk.} = \frac{7}{9} \times \frac{7}{1} \times \frac{24}{1} \times \frac{60}{1} = 7840 \text{ min.}$$

(4)

$$\frac{9}{16} \text{ lb.} = \frac{9}{16} \times \frac{8}{1} \times \frac{5}{1} \times \frac{24}{1} = 3240 \text{ gr.}$$

(5)

$$\frac{2}{3} \text{ in.} = \frac{2}{3} \times \frac{1}{12} \times \frac{1}{3} \times \frac{1}{5\frac{1}{2}} = \frac{1}{36} \text{ rd.}$$

(6)

$$\frac{4}{5} \text{ in.} = \frac{4}{5} \times \frac{1}{12} \times \frac{1}{3} = \frac{1}{45} \text{ yd.}$$

(7)

$$\frac{11}{20} \text{ sec.} = \frac{11}{20} \times \frac{1}{60} \times \frac{1}{60} = \frac{11}{7200} \text{ deg.}$$

(8)

$$\frac{15}{26} \text{ cu. ft.} = \frac{15}{26} \times \frac{1}{128} = \frac{15}{3328} \text{ C}$$

(9)

$$\mathcal{L}_{16}^7 = 8\text{s. } 9\text{d.}$$

$$\begin{array}{r} 7 \\ 20 \\ 16 \overline{)140} \\ \text{s. } 8 \dots 12 \\ \quad 12 \\ 16 \overline{)144} \\ \text{d. } 9 \end{array}$$

$$\mathcal{L}_{15}^7 = 9\text{s. } 4\text{d.}$$

$$\begin{array}{r} 7 \\ 20 \\ 15 \overline{)140} \\ \text{s. } 9 \dots 5 \\ \quad 12 \\ 15 \overline{)60} \\ \text{d. } 4 \end{array}$$



(10)

$$\frac{7}{8} \text{ mi.} = 6 \text{ fur. } 8 \text{ rd. } 4 \text{ yd. } 2 \text{ ft. } 8 \text{ in.}$$

$$\begin{array}{r} 7 \\ 8 \\ 9 \overline{)56} \\ \text{fur. } 6 \dots 2 \end{array}$$

$$\begin{array}{r} 40 \\ 9 \overline{)80} \\ \text{rd. } 8 \dots 8 \end{array}$$

$$\begin{array}{r} 6 \\ 8 \\ 7 \overline{)48} \\ \text{fur. } 6 \dots 6 \end{array}$$

$$\begin{array}{r} 40 \\ 7 \overline{)240} \\ \text{rd. } 34 \dots 2 \end{array}$$

$$\begin{array}{r} 5\frac{1}{2} \\ 9 \overline{)44} \\ \text{yd. } 4 \dots 8 \end{array}$$

$$\begin{array}{r} 3 \\ 9 \overline{)24} \\ \text{ft. } 2 \dots 6 \end{array}$$

$$\begin{array}{r} 12 \\ 9 \overline{)72} \\ \text{in. } 8 \end{array}$$

$$\begin{array}{r} 5\frac{1}{2} \\ 7 \overline{)11} \\ \text{yd. } 1 \dots 4 \end{array}$$

$$\begin{array}{r} 3 \\ 7 \overline{)12} \\ \text{ft. } 1 \dots 5 \end{array}$$

$$\begin{array}{r} 12 \\ 7 \overline{)60} \\ \text{in. } 8\frac{4}{5} \end{array}$$

(11)

$$\frac{5}{6} \text{ fur.} = 33 \text{ rd. } 1 \text{ yd. } 2 \text{ ft. } 6 \text{ in.}$$

$$\begin{array}{r} 5 \\ 40 \\ 6 \overline{)200} \\ \text{rd. } 33 \dots 2 \end{array}$$

$$\begin{array}{r} 5\frac{1}{2} \\ 6 \overline{)11} \\ \text{yd. } 1 \dots 5 \end{array}$$

$$\begin{array}{r} 3 \\ 6 \overline{)15} \\ \text{ft. } 2 \dots 3 \end{array}$$

$$\begin{array}{r} 12 \\ 6 \overline{)86} \\ \text{in. } 6 \end{array}$$

(12)

$$\frac{3}{4} \text{ guin.} = \frac{3}{4} \times \frac{1}{12} \times \frac{1}{21} = \frac{1}{28} \text{ guin.}$$

(13)

$$\frac{7}{8} \text{ far.} = \frac{7}{8} \times \frac{1}{4} \times \frac{1}{12} \times \frac{1}{24} \times \frac{1}{6} = \frac{1}{1728} \text{ far.}$$

(14)

$$\frac{9}{11} \text{ hr.} = \frac{9}{11} \times \frac{60}{1} \times \frac{60}{1} \times \frac{1}{5} = \frac{648}{11} \text{ min.}$$

(1)

7 fur. 28 rd. 2 yd. = 1696 yd.

1 mile = 1760 "

$$\frac{1696}{1760} = \frac{43}{44} \text{ miles. } Ans.$$

(2)

17s. 6d. 2 far. = 842 far.

£1 = 960 "

$$\frac{842}{960} = \frac{421}{480} \text{ Ans.}$$

(3)

19 cwt. 3 qr. 16 lb. = 1991 lb.

1 ton = 2000 "

$$\frac{1991}{2000} \text{ ton. } Ans.$$

(4)

9 oz. 5½ pwt. = 9275 thspwt.

1 lb. = 1200 "

$$\frac{927}{1200} = \frac{309}{400} \text{ lb. } Ans.$$

(5)

5 da. 16 hr. 40 min. = 8200 min.

1 wk. = 10080 "

$$\frac{8200}{10080} = \frac{205}{252} \text{ Ans.}$$

(6)

3 pk. 7 qt. 1 pt. = 63 pt.

1 bu. = 64 "

$$\frac{63}{64} \text{ bu. } Ans.$$

(7)

3 qr. 3 na. 1 in. = 127 fourths of 1 inch.

1 yd. = 144 " "

$$\frac{127}{144} \text{ yd. } Ans.$$

(8)

18s. 8d. 3 far. = 899 far.

£1 9s. 6d. = 1416 "

$$\frac{899}{1416} \text{ Ans.}$$

(9)

⅞ s. = 10d. 2 far. = 42 far.

£½ = 12s. = 576 "

$$\frac{42}{576} = \frac{7}{96} \text{ Ans.}$$

(10)

4⅞ d. = 43 ninths of a penny.

£⅓ = 8s. 10½d. = 960 " "

$$\frac{43}{960} \text{ Ans.}$$

## ADDITION.

(2)

$$\frac{1}{2} + \frac{1}{3} = \frac{3}{6} + \frac{2}{6} = \frac{5}{6}; \quad \frac{1}{2} + \frac{1}{5} = \frac{5}{10} + \frac{2}{10} = \frac{7}{10}; \quad \frac{1}{7} + \frac{1}{9} = \frac{9}{63} + \frac{7}{63} = \frac{16}{63};$$

$$\frac{1}{5} + \frac{1}{10} = \frac{2}{10} + \frac{1}{10} = \frac{3}{10} \text{ Ans.}$$

(3)

$$\frac{1}{2} + \frac{1}{10} = \frac{5}{10} + \frac{1}{10} = \frac{6}{10}; \quad \frac{1}{5} + \frac{1}{6} = \frac{2}{6} + \frac{1}{6} = \frac{3}{6};$$

$$\frac{1}{6} + \frac{1}{9} = \frac{3}{18} + \frac{2}{18} = \frac{5}{18}; \quad \frac{1}{8} + \frac{1}{5} = \frac{5}{40} + \frac{8}{40} = \frac{13}{40} \text{ Ans.}$$

(1)

$$\frac{5}{9} + \frac{7}{12} + \frac{5}{18} + \frac{21}{17} = \frac{340}{612} + \frac{357}{612} + \frac{170}{612} + \frac{756}{612} = \frac{1623}{612} = 2\frac{133}{204}$$

612 = least com. denom.

$$612 \div 9 = 68; \quad 68 \times 5 = 340 \text{ 1st numerator.}$$

$$612 \div 12 = 51; \quad 51 \times 7 = 357 \text{ 2d "}$$

$$612 \div 18 = 34; \quad 34 \times 5 = 170 \text{ 3d "}$$

$$612 \div 17 = 36; \quad 36 \times 21 = 756 \text{ 4th "}$$

$$\frac{1623}{612} = \text{sum.}$$

$$612 \overline{)1623}$$

$$2\frac{399}{204} = 2\frac{133}{204} \text{ Ans.}$$

(2)

$$\frac{7}{8} + \frac{7}{12} + \frac{13}{16} + \frac{11}{18} + \frac{19}{24} = \frac{126}{144} + \frac{84}{144} + \frac{117}{144} + \frac{88}{144} + \frac{114}{144} =$$

$$\frac{529}{144} = 3\frac{97}{144} \text{ Ans.}$$

(3)

$$\frac{3}{4} + \frac{5}{8} + \frac{9}{16} + \frac{5}{32} + \frac{15}{64} = \frac{48}{64} + \frac{40}{64} + \frac{36}{64} + \frac{10}{64} + \frac{15}{64} = \frac{149}{64} = 2\frac{21}{64} \text{ Ans.}$$

(4)

$$\frac{1}{16} + \frac{3}{7} + \frac{2}{8} + \frac{4}{9} = \frac{63}{1008} + \frac{432}{1008} + \frac{252}{1008} + \frac{448}{1008} = \frac{1195}{1008} = 1\frac{187}{1008}$$

(5)

$$\frac{1}{8} + (4\frac{1}{2})\frac{1}{3} + \frac{2}{8} = \frac{3}{12} + \frac{25}{12} + \frac{2}{12} = \frac{30}{12} = 2\frac{1}{2} \text{ Ans.}$$

(6)

$$\frac{3}{11} + \frac{5}{12} + \frac{13}{14} + \frac{7}{15} = \frac{36}{132} + \frac{55}{132} + \frac{117}{132} + \frac{63}{132} = \frac{271}{132} \text{ Ans.}$$

(7)

$$\frac{9}{17} + \frac{5}{12} + \frac{2}{3} + \frac{7}{8} = \frac{195}{2040} + \frac{850}{2040} + \frac{5440}{2040} + \frac{1755}{2040} = \frac{3484}{2040} = 2\frac{451}{255}$$

(8)

$$\frac{13}{4} + \frac{27}{5} + \frac{7}{2} = \frac{91}{20} + \frac{108}{20} + \frac{70}{20} = \frac{269}{20} = 9\frac{9}{20} \text{ Ans.}$$

(9)

$$\frac{103}{22} + \frac{32}{3} + \frac{17}{14} + \frac{41}{15} = \frac{1592}{462} + \frac{4930}{462} + \frac{475}{462} + \frac{1640}{462} = \frac{9337}{462} = 15\frac{337}{462}$$

(10)

$$\frac{13}{5} + \frac{25}{8} + \frac{153}{40} = \frac{104}{40} + \frac{125}{40} + \frac{153}{40} = \frac{482}{40} = 11\frac{2}{20} \text{ Ans.}$$

(11)

$$\frac{51}{4} + \frac{29}{3} + \frac{72}{14} = \frac{1071}{84} + \frac{812}{84} + \frac{412}{84} = \frac{2295}{84} = 36\frac{11}{14} \text{ Ans.}$$

(12)

$$\frac{9}{10} \text{ of } 6\frac{7}{8} = \frac{9}{10} \text{ of } \frac{55}{8} = \frac{99}{16}; \quad \frac{2}{7} \text{ of } \frac{15}{2} = \frac{30}{7};$$

$$\frac{99}{16} + \frac{30}{7} = \frac{693}{112} + \frac{480}{112} = \frac{1173}{112} = 10\frac{53}{112} \text{ Ans.}$$

(13)

$$\frac{1}{5} \text{ of } \frac{75}{8} = \frac{15}{8}; \quad \frac{2}{3} \text{ of } \frac{37}{4} = \frac{37}{12};$$

$$\frac{15}{8} + \frac{37}{12} = \frac{180}{96} + \frac{296}{96} = \frac{476}{96} = 4\frac{11}{24} \text{ Ans.}$$

(14)

$$\frac{2}{3} + \frac{7}{12} + \frac{5}{2} = \frac{66}{110} + \frac{360}{110} + \frac{275}{110} = \frac{701}{110} = 6\frac{41}{110} \text{ Ans.}$$

(15)

$$\frac{35}{8} + \frac{0}{11} \text{ of } \frac{1}{\frac{6}{2}} \text{ of } \frac{31}{2} = \frac{35}{8} + \frac{93}{44} = \frac{385}{88} + \frac{186}{88} = \frac{571}{88} = 6\frac{43}{88} \text{ Ans.}$$

(16)

$$3\frac{5}{7} + 4\frac{5}{8} + \frac{1}{3} \text{ of } 16 = \frac{26}{7} + \frac{37}{8} + \frac{16}{3} = \frac{624}{168} + \frac{777}{168} + \frac{896}{168} = \frac{2297}{168} = 13\frac{13}{168} \text{ Ans.}$$

(17)

$$2+9+5=16; \frac{5}{8} + \frac{5}{8} + \frac{3}{4} = \frac{15}{24} + \frac{20}{24} + \frac{15}{24} = \frac{53}{24} = 2\frac{5}{24};$$

$$16 + 2\frac{5}{24} = 18\frac{5}{24} \text{ Ans.}$$

(18)

$$35+28+25=88; \frac{1}{3} + \frac{4}{7} + \frac{7}{21} = \frac{7}{21} + \frac{12}{21} + \frac{7}{21} = \frac{26}{21} = 1\frac{5}{21};$$

$$88 + 1\frac{5}{21} = 89\frac{5}{21} \text{ Ans.}$$

(19)

$$54+55+51+50=210; \frac{3}{4} + \frac{3}{8} + \frac{7}{16} + \frac{3}{2} = \frac{39}{16} + \frac{13}{16} + \frac{14}{16} + \frac{31}{16} = \frac{97}{16} = 6\frac{1}{16};$$

$$2\frac{7}{8} + 210 = 212\frac{7}{8} \text{ Ans.}$$

(20)

$$3+7+5=15; \frac{7}{12} + \frac{4}{3} + \frac{3}{4} + \frac{1}{6} = \frac{31}{12} + \frac{16}{12} + \frac{27}{12} + \frac{6}{12} = \frac{70}{12} = 5\frac{5}{6};$$

$$14\frac{7}{8} + 15 = 16\frac{17}{8} \text{ Ans.}$$

(21)

$$22+20+21=63; \frac{5}{8} + \frac{7}{8} + \frac{4}{3} = \frac{100}{120} + \frac{105}{120} + \frac{96}{120} = \frac{301}{120} = 2\frac{61}{120};$$

$$63 + 2\frac{61}{120} = 65\frac{61}{120} \text{ Ans.}$$

(22)

$$18+19+19+21+20=97; \frac{7}{12}+\frac{11}{20}+\frac{5}{6}+\frac{11}{15}+\frac{3}{8}= \\ \frac{105}{120}+\frac{99}{120}+\frac{100}{120}+\frac{132}{120}+\frac{130}{120}=\frac{566}{120}=3\frac{13}{30}; 3\frac{13}{30}+97=100\frac{13}{30}$$

(23)

$$17+25+46=88; \frac{3}{5}+\frac{2}{3}+\frac{8}{15}=\frac{27}{15}+\frac{10}{15}+\frac{24}{15}=\frac{61}{15}=1\frac{11}{15}; \\ 1\frac{11}{15}+88=89\frac{11}{15} \text{ Ans.}$$

(24)

$$112+9+225=346; \frac{6}{7}+\frac{5}{12}+\frac{9}{14}=\frac{72}{84}+\frac{35}{84}+\frac{54}{84}=\frac{161}{84}=1\frac{1}{12} \\ 346+1\frac{1}{12}=347\frac{1}{12} \text{ bu.} \\ 250+62+104=416; \frac{4}{5}+\frac{3}{8}+\frac{7}{9}=\frac{288}{360}+\frac{135}{360}+\frac{280}{360}=1\frac{343}{360}; \\ 1\frac{343}{360}+416=417\frac{343}{360} \text{ Ans.}$$

(1)

$$\frac{3}{8} \text{ yd.} \times 3 \text{ ft.} \times 12 \text{ in.} = 2\frac{7}{2} \text{ in.} = 13\frac{1}{2} \text{ in.}; 13\frac{1}{2} \text{ in.} + \frac{5}{9} \text{ in.} = 14\frac{1}{18} \text{ in.}$$

(2)

$$\frac{1}{3} \text{ wk.} \times 7 \times 24 = 56 \text{ hr.}; \frac{1}{4} \text{ da.} \times 24 = 6 \text{ hr.}; \text{ then,} \\ 56 \text{ hr.} + 6 \text{ hr.} + \frac{1}{2} \text{ hr.} = 62\frac{1}{2} \text{ hr.} = 2 \text{ da. } 14\frac{1}{2} \text{ hr.} \text{ Ans.}$$

(3)

$$\frac{5}{8} \text{ cwt.} \times 4 \times 25 \times 16 = 1000 \text{ oz.}; \frac{4}{8} \text{ lb.} \times 16 = 114\frac{2}{3} \text{ oz.}; 15 \text{ oz.}; \\ \frac{2}{3} \text{ cwt.} \times 4 \times 25 \times 16 = 1066\frac{2}{3} \text{ oz.}; 7 \text{ lb.} = 112 \text{ oz.}; 1000 + 114\frac{2}{3} + \\ 15 + 1066\frac{2}{3} + 112 = 2308\frac{1}{3} \text{ oz.} = 1 \text{ cwt. } 1 \text{ qr. } 19 \text{ lb. } 4\frac{1}{3} \text{ oz.}$$

(4)

$$\frac{1}{8} \text{ lb. Troy} = 2 \text{ oz. } 8 \text{ pwt.}; \frac{1}{8} \text{ oz.} = 2 \text{ pwt. } 12 \text{ gr.}; \\ 2 \text{ oz. } 8 \text{ pwt.} + 2 \text{ pwt. } 12 \text{ gr.} = 2 \text{ oz. } 10 \text{ pwt. } 12 \text{ gr.} \text{ Ans.}$$

(5)

$$\frac{4}{9} \text{ of a ton} = 8 \text{ cwt. } 3 \text{ qr. } 13 \text{ lb. } 14\frac{2}{3} \text{ oz.}; \\ \frac{1}{12} \text{ of a cwt.} = \frac{1 \text{ qr. } 16 \text{ lb. } 10\frac{2}{3} \text{ oz.}}{9 \text{ cwt. } 1 \text{ qr. } 5 \text{ lb. } 8\frac{8}{9} \text{ oz.} \text{ Ans.}}$$

(6)

 $\frac{5}{8}$  of a chal.=20 bushels ; $\frac{3}{7}$  of a bush.= 1 pk.  $5\frac{5}{7}$  qt.

---

20 bu. 1 pk.  $5\frac{5}{7}$  qt. *Ans.*

(7)

 $\frac{3}{4}$  of a tun=3 hhd. $\frac{2}{5}$  of a hhd.= 37 gal. 3 qt. 0 pt.  $1\frac{3}{5}$  gi.

---

3 hhd. 37 gal. 3 qt. 0 pt.  $1\frac{3}{5}$  gi. *Ans.*

(8)

 $\frac{1}{8}$  of  $\frac{3}{4}$  of a common year=54 da. 18 hr. $\frac{3}{8}$  of  $\frac{5}{6}$  of a day = 5 hr. $\frac{1}{9}$  of  $\frac{2}{3}$  of  $\frac{3}{8}$  of  $19\frac{1}{2}$  hr. = 3 hr. 47 min. 30 sec.

---

55 da. 2 hr. 47 min. 30 sec.

(9)

 $\frac{5}{8}$  of an acre=2 R. 20 P. $\frac{3}{4}$  of 19 sq. ft.= 11 sq. ft.  $57\frac{3}{4}$  sq. in. $\frac{1}{8}$  of a sq. in.=  $\frac{1}{8}$  sq. in.

---

2 R. 20 P. 11 sq. ft.  $58\frac{1}{8}$  sq. in. *Ans.*

(10)

 $\frac{1}{7}$  of a yard= $5\frac{1}{7}$  inches $\frac{1}{7}$  of a foot= $1\frac{1}{7}$  " $\frac{1}{7}$  of an inch= $\frac{1}{7}$  "

---

7 inches. *Ans.*

(11)

 $\frac{3}{4}$  of a £ =13s. 4d. $\frac{5}{9}$  of a shilling= $6\frac{2}{3}$ d.

---

13s.  $10\frac{2}{3}$ d. *A.*

(12)

 $\frac{7}{8}$  of a mile=7 fur. $\frac{2}{3}$  of a yard= 2 ft. $\frac{3}{4}$  of a foot=9 in.7 fur. 2 ft. 9 in. *Ans.*

(13)

$$\begin{array}{rcl}
 \frac{2}{3} \text{ of a leap year} & = & 219 \text{ da. } 14 \text{ hr. } 24 \text{ min.} \\
 \frac{1}{2} \text{ of a week} & = & 2 \text{ da. } 8 \text{ hr.} \\
 \frac{1}{2} \text{ of a day} & = & 3 \text{ hr.} \\
 \hline
 & & 222 \text{ da. } 1 \text{ hr. } 24 \text{ min. } \textit{Ans.}
 \end{array}$$

(14)

$$\begin{array}{rcl}
 \frac{2}{3} \text{ of a pound Troy} & = & 7 \text{ oz. } 4 \text{ pwt.} \\
 \frac{1}{2} \text{ of an ounce} & = & 3 \text{ pwt. } 8 \text{ gr.} \\
 \frac{1}{2} \text{ of a pennyweight} & = & 15 \text{ gr.} \\
 \hline
 & & 7 \text{ oz. } 7 \text{ pwt. } 23 \text{ gr. } \textit{Ans.}
 \end{array}$$

(15)

$$\begin{array}{rcl}
 \frac{2}{3} \text{ of a Circle} & = & 1 \text{ sign } 26^{\circ} 50' 31\frac{1}{3}'' \\
 3\frac{1}{2} \text{ signs} & = & 3 \text{ signs } 18^{\circ} 45' \\
 \frac{2}{3} \text{ of a degree} & = & 40' \\
 \frac{2}{3} \text{ of } 5\frac{1}{2} \text{ minutes} & = & 1' 8\frac{1}{3}'' \\
 \hline
 & & 5 \text{ signs } 16^{\circ} 16' 40\frac{29}{33}'' \textit{ Ans.}
 \end{array}$$

(16)

$$\begin{array}{rcl}
 \frac{1}{2} \text{ of a yard} & = & 3 \text{ qr. } 2 \text{ na.} \\
 \frac{2}{3} \text{ of } \frac{5}{8} \text{ of a quarter} & = & 1\frac{1}{2} \text{ na.} \\
 3\frac{1}{2} \text{ nails} & = & 3\frac{1}{2} \text{ na.} \\
 \hline
 & & 1 \text{ yd. } 0 \text{ qr. } 2\frac{5}{8} \text{ na. } \textit{Ans.}
 \end{array}$$

(17)

$$\begin{array}{rcl}
 \frac{2}{3} \text{ of a cord} & = & 1 \text{ cord ft. } 8 \text{ cu. ft.} \\
 \frac{5}{8} \text{ of a cubic foot} & = & 960 \text{ cu. in.} \\
 \frac{2}{3} \text{ of } \frac{1}{2} \text{ of } 24\frac{3}{4} \text{ cu. ft.} & = & 2 \text{ cu. ft. } 1234\frac{2}{3} \text{ cu. in.} \\
 \hline
 & & 1 \text{ cord ft. } 11 \text{ cu. ft. } 466\frac{2}{3} \text{ cu. in. } \textit{A.}
 \end{array}$$



(18)

$$\begin{array}{rcl}
 \frac{3}{4} \text{ of } \frac{1}{2} \text{ of 4 cords} & = & 1 \text{ cord 4 cord ft.} \\
 \frac{5}{8} \text{ of } \frac{9}{16} \text{ of 15 cord ft.} & = & 7 \text{ " } 0 \text{ cu. ft. 864 cu. in.} \\
 \frac{5}{9} \text{ of } 31\frac{1}{2} \text{ cu. ft.} & = & 1 \text{ " } 1 \text{ " } 864 \text{ " } \\
 & & \hline
 & & 2 \text{ cords 4 cord ft. 2 cu. ft. } \textit{Ans.}
 \end{array}$$

(19)

$$\begin{array}{rcl}
 \frac{5}{8} \text{ of 3 E. E.} & = & 3 \text{ yd. } 0 \text{ qr. } 2 \text{ na.} \\
 \frac{5}{12} \text{ of a yard} & = & 1 \text{ qr. } 2\frac{1}{2} \text{ na.} \\
 & & \hline
 & & 3 \text{ yd. } 2 \text{ qr. } 0\frac{1}{2} \text{ na. } \textit{Ans.}
 \end{array}$$

(20)

$$\begin{array}{rcl}
 \frac{4}{5} \text{ of 3 A. 1 R. 20 P.} & = & 2 \text{ A. } 2 \text{ R. } 32 \text{ P.} \\
 \frac{2}{3} \text{ of an acre} & = & 1 \text{ R. } 20 \text{ P.} \\
 \frac{2}{4} \text{ of 3 R. 15 P.} & = & 2 \text{ R. } 21\frac{1}{4} \text{ P.} \\
 & & \hline
 & & 3 \text{ A. } 2 \text{ R. } 33\frac{1}{4} \text{ P. } \textit{Ans.}
 \end{array}$$

(21)

$$\begin{array}{rcl}
 \frac{7}{12} \text{ of a ton} & = & 11 \text{ cwt. } 2 \text{ qr. } 16 \text{ lb. } 10 \text{ oz. } 10\frac{1}{2} \text{ dr.} \\
 \frac{3}{10} \text{ of a cwt.} & = & 1 \text{ qr. } 5 \text{ lb.} \\
 \frac{5}{12} \text{ of an ounce} & = & 6\frac{1}{2} \text{ dr.} \\
 & & \hline
 & & 11 \text{ cwt. } 3 \text{ qr. } 21 \text{ lb. } 11 \text{ oz. } 1\frac{1}{2} \text{ dr. } \textit{Ans.}
 \end{array}$$

(22)

$$\begin{array}{rcl}
 \frac{1}{2} \text{ of } \frac{2}{3} \text{ of a mile} & = & 2 \text{ fur. } 16 \text{ rd.} \\
 \frac{2}{3} \text{ of a furlong} & = & 24 \text{ rd.} \\
 \frac{4}{33} \text{ of a rod} & = & 2 \text{ ft.} \\
 \frac{1}{2} \text{ of a foot} & = & 6 \text{ in.} \\
 & & \hline
 & & 3 \text{ fur. } 0 \text{ rd. } 2 \text{ ft. } 6 \text{ in. } \textit{Ans.}
 \end{array}$$

## SUBTRACTION.

$$(1) \quad \frac{3}{7} - \frac{1}{7} = \frac{2}{7}$$

$$(2) \quad \frac{14}{18} - \frac{11}{18} = \frac{3}{18}$$

$$(3) \quad \frac{15}{25} - \frac{12}{25} = \frac{3}{25}$$

$$(4) \quad \frac{204}{305} - \frac{104}{305} = \frac{100}{305} = \frac{20}{61}$$

$$(5) \quad \frac{6}{7} - \frac{4}{7} = \frac{20}{35} - \frac{28}{35} = \frac{2}{35}$$

$$(6) \quad \frac{11}{12} - \frac{13}{16} = \frac{176}{192} - \frac{156}{192} = \frac{20}{192} = \frac{5}{48}$$

$$(7) \quad \frac{14}{15} - \frac{12}{15} = \frac{182}{195} - \frac{180}{195} = \frac{2}{195}$$

$$(8) \quad 37\frac{11}{15} - \frac{1}{3} \text{ of } 5\frac{5}{8} = \frac{566}{15} - \frac{35}{18} = \frac{3396}{90} - \frac{175}{90} = \frac{3221}{90} = 35\frac{71}{90}$$

$$(9) \quad \frac{3}{4} - \frac{5}{8} = \frac{27}{36} - \frac{20}{36} = \frac{7}{36}$$

$$(10) \quad \frac{7}{8} - \frac{5}{18} = \frac{126}{144} - \frac{40}{144} = \frac{86}{144} = \frac{43}{72}$$

$$(11) \quad \frac{25}{1} - \frac{11}{15} = \frac{375}{15} - \frac{11}{15} = \frac{364}{15} = 24\frac{4}{15}$$

$$(12) \quad \frac{6}{15} \text{ of } 3 - \frac{1}{3} \text{ of } \frac{4}{9} = \frac{6}{5} - \frac{4}{27} = \frac{162}{135} - \frac{20}{135} = \frac{142}{135} = 1\frac{7}{135}$$

$$(13) \quad \frac{1}{7} \text{ of } \frac{6}{5} \text{ of } \frac{7}{1} - \frac{3}{8} = \frac{1}{2} - \frac{3}{8} = \frac{4}{8} - \frac{3}{8} = \frac{1}{8}$$

$$(14) \quad 3\frac{5}{8} - \frac{2}{3} \text{ of } \frac{7}{8} = \frac{29}{8} - \frac{7}{12} = \frac{87}{24} - \frac{14}{24} = \frac{73}{24} = 3\frac{1}{24}$$

$$(15) \quad \frac{2}{3} \text{ of } \frac{15}{1} - \frac{4}{5} \text{ of } \frac{6}{1} = \frac{10}{1} - \frac{12}{5} = \frac{50}{5} - \frac{12}{5} = \frac{38}{5} = 7\frac{3}{5}$$

$$(16) \quad \frac{4}{3} - \frac{1}{15} = \frac{220}{15} - \frac{1}{15} = \frac{219}{15} = 14\frac{3}{5}$$

(17)

$$\frac{5}{8} - \frac{3}{8} = \frac{25}{40} - \frac{15}{40} = \frac{10}{40}$$

(18)

$$5 - 1\frac{1}{5} = \frac{45}{9} - \frac{16}{9} = \frac{29}{9} = 3\frac{2}{9}$$

(19)

$$17\frac{3}{5} - 7\frac{2}{5} = \frac{83}{5} - \frac{33}{5} = \frac{50}{5} = 10 \quad \text{Ans.}$$

(20)

$$3\frac{5}{8} + 10\frac{4}{8} = 14\frac{11}{8}; 25\frac{1}{4} - 17\frac{11}{20} = 7\frac{1}{4}; 14\frac{11}{8} - 7\frac{1}{4} = 6\frac{7}{8} \quad \text{Ans.}$$

(21)

$$9 - \frac{3}{8} \text{ of } \frac{7}{8} = 9 - \frac{21}{80}; 8\frac{1}{10} + \frac{1}{2} \text{ of } \frac{1}{2} = \frac{33}{40} + \frac{1}{8} = \frac{35}{40} = \frac{7}{8} \quad \text{Ans.}$$

(22)

$$\frac{3}{8} \text{ of } \frac{1}{2} = \frac{3}{16}; \frac{1}{2} \text{ of } \frac{5}{8} = \frac{5}{16}; \frac{5}{16} \text{ of } \frac{8}{15} = \frac{2}{3} \text{ of the whole vessel sold;}$$

$$\frac{8}{15} - \frac{2}{3} = \frac{1}{15} \text{ the part left.}$$

(23)

$$\frac{1}{2} \text{ of } \frac{1}{2} \text{ of } \frac{1}{10} \text{ of } \frac{500}{1} = \$120; \frac{5}{6} \text{ of } \frac{1}{2} \text{ of } \frac{3}{4} \text{ of } \frac{1680}{1} = \$192;$$

$$192 - 120 = \$72 \quad \text{Ans.}$$

(24)

$$2\frac{1}{4} - 1\frac{1}{8} = \frac{9}{4} - \frac{15}{8} = \frac{18}{8} - \frac{15}{8} = \frac{3}{8} \quad \text{Ans.}$$

(25)

$$31\frac{1}{2} - 12\frac{5}{7} = \frac{63}{2} - \frac{89}{7} = \frac{441}{14} - \frac{178}{14} = 18\frac{1}{14} \quad \text{Ans.}$$

(26)

$$10\frac{3}{4} + 24\frac{5}{8} = 35\frac{1}{2} \text{ cords; } 35\frac{1}{2} - 16\frac{7}{8} = 18\frac{3}{8} \text{ cords. } \text{Ans.}$$

(27)

$$54\frac{9}{10} + 56\frac{1}{2} = 111\frac{19}{20}; 43\frac{1}{2} + 34\frac{1}{2} = 78\frac{1}{2}; 111\frac{19}{20} - 78\frac{1}{2} =$$

$$33\frac{3}{20} \text{ pounds. } \text{Ans.}$$

(28)

$$15\frac{7}{16} + 12\frac{7}{16} = 28\frac{14}{16}; 50\frac{1}{2} - 28\frac{14}{16} = 22\frac{2}{16} \text{ Ans.}$$

(29)

$$\frac{1}{2} + \frac{1}{4} = \frac{3}{4}; \frac{3}{4} - \frac{2}{8} = \frac{3}{8} \text{ Ans.}$$

(30)

$$27\frac{1}{2} + 32\frac{1}{2} = 59\frac{1}{2}; 59\frac{1}{2} - 40\frac{1}{2} = 19 \text{ Ans.}$$

(2)

$$\frac{1}{5} - \frac{1}{15} = \frac{2}{15} = \frac{2}{15}$$

(3)

$$\frac{1}{4} - \frac{1}{15} = \frac{11}{60}$$

(4)

$$\frac{1}{19} - \frac{1}{20} = \frac{1}{380}$$

(5)

$$\frac{1}{17} - \frac{1}{30} = \frac{13}{510} = \frac{13}{510}$$

(2)

$$\begin{array}{r} 14\frac{4}{7} = 14\frac{16}{33} \\ 12\frac{6}{19} = 12\frac{42}{33} \\ \hline 2\frac{34}{33} \end{array}$$

(3)

$$\begin{array}{r} 115\frac{3}{8} \\ 39\frac{7}{8} \\ \hline 76\frac{1}{4} \end{array}$$

(4)

$$\begin{array}{r} 78\frac{2}{16} = 78\frac{6}{32} \\ 4\frac{7}{32} = 4\frac{7}{32} \\ \hline 73\frac{1}{32} \end{array}$$

(5)

$$\begin{array}{r} 48\frac{5}{19} = 48\frac{10}{38} \\ 41\frac{15}{38} = 41\frac{15}{38} \\ \hline 6\frac{25}{38} \end{array}$$

(6)

$$\begin{array}{r} 287\frac{5}{26} = 287\frac{20}{106} \\ 104\frac{37}{106} = 104\frac{37}{106} \\ \hline 182\frac{57}{106} \end{array}$$

(1)

$$\begin{array}{l} \frac{2}{3} \text{ of a pound} = 10 \text{ oz. } 0 \text{ pwt. } 0 \text{ gr.} \\ \frac{2}{3} \text{ of an ounce} = \frac{12 \text{ pwt. } 12 \text{ gr.}}{9 \text{ oz. } 7 \text{ pwt. } 12 \text{ gr.}} \text{ Ans.} \end{array}$$

(2)

$$\begin{array}{l} \frac{2}{3} \text{ of a ton} = 7 \text{ cwt. } 2 \text{ qr. } 0 \text{ lb. } 0 \text{ oz.} \\ \frac{2}{3} \text{ of } \frac{3}{4} = \frac{1}{2} \text{ lb.} = \frac{8 \text{ oz.}}{7 \text{ cwt. } 1 \text{ qr. } 24 \text{ lb. } 8 \text{ oz.}} \text{ Ans.} \end{array}$$

(3)

$$\frac{3}{4} \text{ of } \frac{4}{5} \text{ of a hhd.} = \frac{3}{5} \text{ hhd.} = 30 \text{ gal.}$$

$$\frac{3}{4} \text{ of } \frac{1}{2} \text{ of a qt.} = \frac{3}{8} \text{ qt.}$$


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$$29 \text{ gal. } 3\frac{3}{4} \text{ qt.}$$

(4)

$$\frac{3}{4} \text{ of a L.} = 1 \text{ mi. } 6 \text{ fur. } 16 \text{ rd}$$

$$\frac{1}{4} \text{ of a mile} = \underline{5 \text{ fur.}}$$

$$1 \text{ mi. } 1 \text{ fur. } 16 \text{ rd. } \textit{Ans.}$$

(5)

$$1\frac{3}{4} \text{ shillings} = 1 \text{ s. } 8 \text{ d.}$$

$$\frac{3}{4} \text{ of } 7\frac{1}{2} \text{ d.} = \underline{5 \text{ d.}}$$

$$1 \text{ s. } 3 \text{ d. } \textit{Ans.}$$

(6)

$$\frac{3}{4} \text{ of a degree} = 45'$$

$$\frac{3}{4} \text{ of } \frac{1}{4} \text{ of a deg.} = \underline{6' 25\frac{1}{4}''}$$

$$38' 34\frac{3}{4}''$$

(7)

$$\frac{1}{2} \text{ of square mile} = 600 \text{ A.}$$

$$36\frac{1}{2} \text{ acres} = \underline{36 \text{ A. } 3 \text{ R. } 4\frac{1}{2} \text{ P.}}$$

$$563 \text{ A. } 0 \text{ R. } 35\frac{1}{2} \text{ P. } \textit{Ans.}$$

(8)

$$\frac{3}{4} \text{ of a ton} = 17 \text{ cwt. } 0 \text{ qr. } 14 \text{ lb. } 4\frac{1}{2} \text{ oz.}$$

$$\frac{3}{4} \text{ of } 12 \text{ cwt.} = 6 \text{ cwt. } 2 \text{ qr. } 16 \text{ lb. } 10\frac{3}{4} \text{ oz.}$$

$$10 \text{ cwt. } 1 \text{ qr. } 22 \text{ lb. } 9\frac{1}{2} \text{ oz. } \textit{Ans.}$$

(9)

$$1\frac{3}{4} \text{ pound Troy} = 1 \text{ lb. } 9 \text{ oz. } 0 \text{ pwt. } 0 \text{ gr.}$$

$$\frac{1}{2} \text{ of an ounce} = \underline{3 \text{ pwt. } 8 \text{ gr.}}$$

$$1 \text{ lb. } 8 \text{ oz. } 16 \text{ pwt. } 16 \text{ gr.}$$

(10)

$$2\frac{3}{4} \text{ cords} = 2 \text{ cords } 3 \text{ C. ft. } 0 \text{ cu. ft.}$$

$$\frac{3}{4} \text{ of a cord ft.} = \underline{12 \text{ cu. ft.}}$$

$$2 \text{ cords } 2 \text{ C. ft. } 4 \text{ cu. ft. } \textit{Ans.}$$

(11)

 $\frac{1}{8}$  of a yard = 6 in. $\frac{2}{3}$  of an inch =  $\frac{2}{3}$  in. $5\frac{1}{3}$  in.

(12)

 $\frac{1}{2}$  of  $\frac{3}{4}$  of lb =  $4\frac{3}{4}$  43 0 D 0 gr. $\frac{1}{2}$  of  $\frac{1}{3}$  of 3 =  $16$  gr. $4\frac{3}{4}$  33 2 D 4 gr. *Ans.*

(13)

 $2\frac{59}{160}$  A. = 2 A. 1 R. 19 P. 0 sq. yd. $1$  " 0 " 1 " 9 " $1$  A. 1 R. 17 P.  $21\frac{1}{4}$  sq. yd. *Ans.*

(14)

1 oz. Avoirdupois =  $\frac{1}{16}$  of 14 oz. 11 pwt. 16 gr. Troy = $437\frac{1}{2}$  gr. Troy ; 1 oz. Troy = 480 gr. Troy ; $480 - 437\frac{1}{2} = 1$  pwt.  $18\frac{1}{2}$  gr.

## MULTIPLICATION.

(1)

$$\frac{3}{7} \times 8 = \frac{24}{7} = 3\frac{3}{7}$$

(2)

$$\frac{8}{\frac{75}{25}} \times \frac{\frac{12}{1}}{1} = \frac{32}{25} = 1\frac{7}{25}$$

(3)

$$\frac{\frac{32}{40}}{5} \times \frac{9}{1} = \frac{36}{5} = 7\frac{1}{5}$$

(4)

$$\frac{11}{13} \times \frac{5}{9} = \frac{55}{117} = 11\frac{1}{13}$$

(5)

$$\frac{4}{5} \text{ of } \frac{4}{7} \times \frac{35}{1} = 16$$

$$(6) \quad 1\frac{3}{4} \text{ of } 2\frac{1}{2} \times 16 = \frac{7}{4} \times \frac{5}{2} \times \frac{16}{1} = 70$$

$$(7) \quad 2\frac{1}{2} \text{ of } \frac{2}{7} \times \frac{7}{1} = \frac{11}{5} \text{ of } \frac{2}{7} \times \frac{7}{1} = 44$$

$$(8) \quad 4\frac{2}{3} \text{ of } \frac{3}{1} \times 36 = \frac{33}{5} \times \frac{8}{1} \times \frac{36}{1} = 1584$$

$$(9) \quad 97 \times \frac{109}{12} = 7\frac{13}{12} \times 608\frac{7}{12}$$

$$(10) \quad 642 \times 64 = 53888 = 5987\frac{1}{2}$$

$$(11) \quad \frac{360}{1} \times \frac{63}{5} = 4536$$

$$(12) \quad \frac{115}{460} \times \frac{47}{4} = 5405$$

$$(13) \quad \frac{155}{620} \times \frac{45}{4} = 6975$$

$$(14) \quad \frac{335}{1340} \times \frac{35}{4} = 11725$$

$$(15) \quad \frac{4}{5} \times \frac{8}{1} = 3\frac{2}{5} = 3\frac{4}{10}$$

$$(16) \quad \frac{15}{1} \times \frac{6}{7} = 12\frac{6}{7}$$

$$(17) \quad 7\frac{7}{8} \times 8 = \frac{63}{8} \times \frac{8}{1} = 63$$

$$(18) \quad 9\frac{1}{2} \times 18\frac{3}{4} = \frac{19}{2} \times \frac{75}{4} = 142\frac{5}{8} = 178\frac{1}{2}$$

$$(19) \quad 3\frac{2}{7} \times 4\frac{14}{33} = \frac{23}{7} \times \frac{146}{33} = 141\frac{24}{331}$$

$$(20) \quad \frac{175}{81} \times \frac{9}{1} = \frac{175}{9} = 19\frac{4}{9}$$

$$(21) \quad \frac{7}{8} \times \frac{3}{5} = 2\frac{1}{40}$$

$$(22) \quad \frac{1}{4} \text{ of } \frac{3}{8} \times \frac{5}{9} = \frac{5}{96}$$

(23)

$$\frac{5}{12} \times \frac{3}{20} \text{ of } \frac{1}{27} = \frac{1}{144}$$

$\frac{5}{6} \quad \frac{3}{4} \quad \frac{1}{3}$

(24)

$$\frac{1}{2} \text{ of } \frac{7}{8} \times \frac{4}{7} \text{ of } \frac{3}{10} = \frac{3}{20}$$

$\frac{1}{2} \quad \frac{7}{8} \times \frac{4}{7} \quad \frac{3}{10}$

(25)

$$\frac{7}{8} \times \frac{16}{1} = 14$$

$\frac{7}{8} \times \frac{16}{1}$

(26)

$$\frac{2}{1} \times \frac{9}{14} = 18$$

$\frac{2}{1} \times \frac{9}{14}$

(27)

$$8\frac{7}{10} \times 15 = \frac{87}{10} \times \frac{15}{1} = \frac{261}{2} = 130\frac{1}{2}$$

$8\frac{7}{10} \times 15$

(28)

$$\frac{2}{11} \text{ of } \frac{2}{3} \times \frac{10}{24} = \frac{5}{33}$$

$\frac{2}{11} \text{ of } \frac{2}{3} \times \frac{10}{24}$

(29)

$$5\frac{1}{4} \times \frac{1}{2} \text{ of } 3\frac{1}{2} = \frac{21}{4} \times \frac{1}{2} \text{ of } \frac{7}{2} = 14$$

$5\frac{1}{4} \times \frac{1}{2} \text{ of } 3\frac{1}{2}$

(30)

$$842\frac{1}{4} \times 7\frac{1}{2} = \frac{3369}{4} \times \frac{15}{2} = \frac{50535}{8} = 6316\frac{7}{8}$$

$842\frac{1}{4} \times 7\frac{1}{2}$

(31)

$$\frac{5}{9} \times \frac{6}{7} = \frac{10}{7}$$

$\frac{5}{9} \times \frac{6}{7}$

(32)

$$\frac{9}{10} \times \frac{42}{11} = \frac{378}{55} = 6\frac{18}{11}$$

$\frac{9}{10} \times \frac{42}{11}$

(33)

$$\frac{7}{11} \times \frac{22}{23} \times \frac{40}{49} = \frac{4}{7}$$

$\frac{7}{11} \times \frac{22}{23} \times \frac{40}{49}$

(34)

$$\frac{14}{27} \times \frac{9}{28} \times \frac{6}{13} \times \frac{26}{30} = \frac{1}{15}$$

$\frac{14}{27} \times \frac{9}{28} \times \frac{6}{13} \times \frac{26}{30}$

(35)

$$\frac{12}{17} \times \frac{2}{9} \times \frac{17}{1} = \frac{8}{3} = 2\frac{2}{3}$$

$\frac{12}{17} \times \frac{2}{9} \times \frac{17}{1}$

(36)

$$\frac{6}{1} \times \frac{2}{3} \text{ of } \frac{5}{1} = 20$$

$\frac{6}{1} \times \frac{2}{3} \text{ of } \frac{5}{1}$

(37)

$$\frac{1}{8} \text{ of } \frac{1}{6} \text{ of } \frac{3}{1} \times \frac{106}{7} = \frac{53}{112}$$

$\frac{1}{8} \text{ of } \frac{1}{6} \text{ of } \frac{3}{1} \times \frac{106}{7}$



$$\begin{array}{l} (38) \\ \frac{2}{9} \text{ of } \frac{3}{5} \times \frac{5}{8} \text{ of } \frac{23}{7} = \frac{69}{252} = 2\frac{3}{84} \end{array} \quad \begin{array}{l} (39) \\ \frac{5}{1} \times \frac{2}{3} \times \frac{2}{7} \text{ of } \frac{3}{5} \times \frac{25}{6} = \frac{50}{21} = 2\frac{2}{3} \end{array}$$

$$\begin{array}{l} (40) \\ 3\frac{3}{4} \times \frac{1}{1} = 3\frac{1}{4} = \$5\frac{1}{4} \end{array} \quad \begin{array}{l} (41) \\ \frac{2}{7} \times \frac{51}{4} = \frac{102}{7} = \$14\frac{4}{7} \end{array} \quad \begin{array}{l} (42) \\ \frac{2}{9} \times \frac{3}{5} = \frac{2}{3} \end{array}$$

$$(43) \quad \frac{5}{8} \times \frac{9}{1} = \frac{45}{8} = 11\frac{1}{8} \text{ tons.}$$

$$(44) \quad \frac{15}{16} \times \frac{3}{1} = \frac{45}{2} = \$22\frac{1}{2}$$

$$(45) \quad \frac{1}{8} \times \frac{1}{2} = \frac{1}{16} = \$3\frac{1}{16}$$

$$(46) \quad \frac{4}{1} \times \frac{11}{12} = \frac{44}{3} = \$14\frac{2}{3}$$

$$(47) \quad 1\frac{1}{2} \times 6\frac{1}{8} = \frac{5}{4} \times \frac{49}{8} = \frac{245}{32} = \$7\frac{21}{32}$$

$$(48) \quad 2\frac{1}{2} \times 3\frac{3}{8} = \frac{5}{2} \times \frac{27}{8} = \frac{135}{8} = \$16\frac{7}{8}$$

$$\begin{array}{l} (49) \\ \frac{5}{1} \times \frac{11}{15} = 55 \text{ cents.} \end{array} \quad \begin{array}{l} (50) \\ 75\frac{3}{15} \times \frac{5}{11} = \frac{1133}{15} \times \frac{5}{11} = \frac{103}{3} = 34\frac{1}{3} \end{array}$$

$$(51) \quad 2\frac{1}{2} \times 17\frac{1}{2} = \frac{5}{2} \times \frac{35}{2} = \frac{175}{4} = 43\frac{3}{4} \text{ shillings.}$$

$$(52) \quad 20\frac{1}{2} \times 15\frac{1}{2} = \frac{104}{5} \times \frac{125}{8} = \$325$$

(53)

$$\frac{\frac{5}{\frac{6}{3}} \times \frac{2}{3}}{\frac{3}{3}} = \frac{10}{9}$$

(54)

$$\frac{\frac{7}{15} \times \frac{3}{14}}{\frac{5}{2}} = \frac{3}{10}$$

(55)

$$\frac{\frac{3}{10} \times \frac{5}{12}}{\frac{2}{4}} = \frac{5}{8}$$

(56)

$$\frac{2}{3} \text{ of } \frac{11}{12} \times \frac{4}{5} \text{ of } \frac{\frac{3}{15}}{\frac{1}{6}} = \frac{11}{14}$$

(57)

$$9\frac{3}{4} \times \frac{2}{3} \text{ of } 3\frac{1}{2} = \frac{13}{4} \times \frac{2}{3} \text{ of } \frac{4}{5} = \frac{104}{5} = 20\frac{4}{5}$$

(58)

$$22\frac{1}{2} \times \frac{5}{2} = \frac{45}{2} \times \frac{5}{9} = \frac{25}{2} = 12\frac{1}{2} \text{ days.}$$

(59)

$$\frac{1}{20} \times 106\frac{2}{3} = \frac{1}{20} \times \frac{320}{3} = \frac{16}{3} = 5\frac{1}{3} \text{ hours.}$$

(60)

$$\frac{\frac{7}{8} \times \frac{4}{5}}{\frac{2}{2}} = \frac{7}{10} = \text{B's share before selling ;}$$

$$\frac{\frac{7}{10} \times \frac{5}{9}}{\frac{2}{2}} = \frac{7}{18} = \text{C's share before selling ;}$$

$$\frac{\frac{7}{10} \times \frac{1}{4}}{\frac{3}{3}} = \frac{1}{3} = \text{D's share.}$$

(61)

$$\frac{40}{1} \times \frac{3}{5} = 120 \text{ A.} = \text{what A owned};$$

$$\frac{40}{1} \times \frac{2}{3} = 80 \text{ A.} = \text{what A sold};$$

$$\frac{20}{1} \times \frac{1}{2} = 20 \text{ A.} = \text{what B sold to C.}$$

## DIVISION.

(1)

$$\frac{21}{15} \div \frac{1}{7} = \frac{21}{15} \times \frac{7}{1} = \frac{147}{15}$$

(2)

$$\frac{9}{14} \div \frac{6}{7} = \frac{9}{14} \times \frac{7}{6} = \frac{3}{2}$$

(3)

$$\frac{13}{15} \div \frac{2}{3} = \frac{13}{15} \times \frac{3}{2} = \frac{13}{10}$$

(4)

$$\frac{120}{315} \div \frac{40}{1} = \frac{120}{315} \times \frac{1}{40} = \frac{2}{315}$$

(5)

$$\frac{23}{64} \div \frac{13}{1} = \frac{23}{64} \times \frac{1}{13} = \frac{23}{832}$$

(6)

$$\frac{5}{1} \div \frac{7}{10} = \frac{5}{1} \times \frac{10}{7} = \frac{50}{7} = 7\frac{1}{7}$$

(7)

$$\frac{27}{1} \div \frac{3}{4} = \frac{27}{1} \times \frac{4}{3} = 36$$

(8)

$$\frac{1}{8} \div \frac{1}{7} = \frac{1}{8} \times \frac{7}{1} = \frac{7}{8}$$

(9)

$$\frac{9}{10} \div \frac{3}{8} = \frac{9}{10} \times \frac{8}{3} = \frac{12}{5} = 2\frac{2}{5}$$

(10)

$$\frac{45}{80} \div \frac{5}{14} = \frac{45}{80} \times \frac{14}{5} = \frac{63}{40} = 1\frac{23}{40}$$

(11)

$$\frac{2}{3} \text{ of } \frac{1}{4} \div \frac{2}{7} \text{ of } \frac{3}{4} = \frac{\frac{2}{3}}{\frac{2}{7}} \times \frac{28}{15} = \frac{112}{15}$$

(12)

$$\frac{7}{8} \text{ of } \frac{6}{7} \div \frac{4}{5} \text{ of } \frac{8}{9} = \frac{\frac{7}{8}}{\frac{4}{5}} \times \frac{45}{32} = \frac{135}{128} = 1\frac{7}{128}$$

(13)

$$\frac{3}{8} \text{ of } \frac{2}{3} \div \frac{3}{4} \text{ of } \frac{5}{6} = \frac{1}{4} \times \frac{8}{5} = \frac{2}{5}$$

(14)

$$5^6 \div 11^2 = 5^6 \times \frac{1}{11^2} = \frac{5^6}{11^2} = 61\frac{1}{11}$$

(15)

$$\frac{1000}{1} \div \frac{80}{133} = \frac{1000}{1} \times \frac{133}{80} = \frac{3325}{2} = 1662\frac{1}{2}$$

(16)

$$\frac{225}{1} \div \frac{25}{17} = \frac{225}{1} \times \frac{17}{25} = 1363$$

(17)

$$4\frac{3}{8} \div 5 = \frac{35}{8} \div 5 = \frac{7}{8}$$

(18)

$$9\frac{1}{11} \div 12 = \frac{104}{11} \times \frac{1}{12} = \frac{26}{33}$$

(19)

$$\frac{1}{3} \text{ of } \frac{33}{2} \div \frac{29}{7} = \frac{11}{2} \times \frac{7}{29} = \frac{77}{58} = 1\frac{19}{58}$$

(20)

$$9\frac{1}{3} \div \frac{1}{2} \text{ of } \frac{7}{6} = \frac{55}{6} \times \frac{2}{7} = \frac{55}{21} = 2\frac{13}{21}$$

$$\frac{5}{\frac{6}{3}} \text{ of } \frac{25}{\frac{50}{1}} \div \frac{13}{3} = \frac{125}{3} \times \frac{3}{13} = \frac{125}{13} = 9\frac{8}{13} \quad (21)$$

$$300\frac{5}{28} \div 6\frac{1}{4} = \frac{1681}{\frac{28}{7}} \times \frac{4}{\frac{28}{5}} = \frac{1681}{35} = 48\frac{1}{35} \quad (22)$$

$$\frac{4}{7} \text{ of } \frac{15}{4} \div \frac{19}{\frac{20}{4}} \text{ of } \frac{3}{2} \div \frac{5}{7} \times \frac{8}{\frac{57}{19}} = \frac{40}{133} \quad (23)$$

$$9\frac{7}{8} \div 8\frac{1}{3} = \frac{79}{8} \times \frac{3}{25} = \frac{237}{200} = 1\frac{37}{200} \quad (24) \quad \frac{5}{9} \text{ of } \frac{7}{11} \div 6\frac{1}{9} = \frac{35}{99} \times \frac{9}{55} = 1\frac{7}{55} \quad (25)$$

$$1\frac{2}{7} \div 4 = \frac{12}{17} \times \frac{1}{4} = \frac{3}{17} \quad (26) \quad \frac{20}{27} \div 5 = \frac{20 \div 5}{27} = \frac{4}{27} \quad (27)$$

$$\frac{92}{78} \div 8 = \frac{60}{75} \times \frac{1}{8} = \frac{1}{10} \quad (28) \quad \frac{432}{321} \div 48 = \frac{432 \div 48}{321} = \frac{9}{21} \quad (29)$$

$$\frac{42}{123} \div 21 = \frac{2}{123} \quad (30) \quad \frac{36}{1} \div \frac{9}{10} = \frac{36}{1} \times \frac{10}{9} = 40 \quad (31)$$

(32)

$$\frac{420}{1} \div \frac{3}{8} = \frac{420}{1} \times \frac{8}{3} = 1120$$

(33)

$$\frac{9}{20} \div \frac{3}{8} = \frac{9}{20} \times \frac{8}{3} = \frac{6}{5} = 1\frac{1}{5}$$

(34)

$$\frac{14}{23} \div \frac{7}{15} = \frac{14}{23} \times \frac{15}{7} = \frac{6}{5} = 1\frac{1}{5}$$

(35)

$$\frac{2}{3} \text{ of } \frac{27}{50} \div \frac{20}{27} = \frac{9}{25} \times \frac{27}{20} = \frac{243}{200}$$

(36)

$$\frac{7}{9} \div \frac{15}{16} = \frac{7}{9} \times \frac{16}{15} = \frac{112}{135}$$

(37)

$$\frac{3}{5} \text{ of } \frac{8}{9} \div \frac{6}{7} \text{ of } \frac{3}{4} = \frac{8}{15} \times \frac{14}{9} = \frac{112}{135}$$

(38)

$$\frac{1}{2} \text{ of } \frac{1}{4} \text{ of } \frac{2}{3} \div \frac{1}{8} \text{ of } \frac{4}{9} = \frac{1}{12} \times \frac{10}{1} = 1\frac{1}{6}$$

(39)

$$\frac{650}{1} \div \frac{100}{127} = \frac{650}{1} \times \frac{127}{100} = \frac{1651}{2} = 825\frac{1}{2}$$

(40)

$$\frac{1273}{1} \div \frac{17}{56} = \frac{1273}{1} \times \frac{56}{17} = 4193\frac{7}{17}$$

(41)

$$\frac{4324}{1} \div \frac{128}{475} = \frac{4324}{1} \times \frac{475}{128} = \frac{513475}{32} = 16046\frac{3}{32}$$

(42)

$$6\frac{2}{3} \div 8 = \frac{56}{9 \times 8} = \frac{56}{72} = \frac{7}{9}$$

(43)

$$12\frac{4}{5} \div 42 = \frac{112}{9} \times \frac{1}{42} = \frac{8}{27}$$

(44)

$$3\frac{1}{8} \div 9\frac{1}{2} = \frac{10}{6} \times \frac{2}{10} = \frac{1}{3}$$

(45)

$$100 \div 4\frac{2}{3} = \frac{100}{1} \times \frac{3}{2} = \frac{100}{2} = 50$$

(46)

$$44\frac{1}{33} \div \frac{213}{33} = \frac{1453}{33} \times \frac{33}{213} = \frac{161283}{2343} = 68\frac{1252}{2343} = 68\frac{552}{781}$$

(47)

$$111\frac{1}{3} \div 33\frac{1}{3} = \frac{1000}{9} \times \frac{3}{1000} = \frac{10}{3} = 3\frac{1}{3}$$

(48)

$$191\frac{1}{5} \div 159\frac{1}{5} = \frac{956}{5} \times \frac{3}{478} = \frac{6}{5} = 1\frac{1}{5}$$

(49)

$$5\frac{2}{3} \div \frac{2}{3} \text{ of } 1\frac{1}{2} = \frac{43}{8} \times \frac{16}{9} = \frac{86}{9} = 9\frac{5}{9}$$

(50)

$$5205\frac{1}{2} \div \frac{1}{2} \text{ of } 20 = \frac{13013}{5} \times \frac{1}{72} = 72\frac{53}{36}$$

(51)

$$2\frac{1}{2} \div \frac{1}{4} = \frac{21}{32} \times \frac{4}{1} = \frac{21}{4} = 5\frac{1}{4} \text{ lb.}$$

(52)

$$\frac{7}{8} \div \frac{1}{2} = \frac{7}{8} \times \frac{2}{1} = \frac{7}{4} = 1\frac{3}{4} \text{ yd.}$$

(53)

$$\frac{3}{16} \div \frac{2}{3} = \frac{3 \div 2}{16 \div 3} = \frac{3}{2} = 1\frac{1}{2} \text{ bush.}$$

(54)

$$\frac{8}{10} = \frac{1}{1} = \frac{8 \div 1}{10 \div 1} = \frac{8}{2} = 4 \text{ horses.}$$

(55)

$$\frac{2}{3} \div \frac{5}{7} = \frac{2}{5} \times \frac{7}{6} = \frac{14}{15}$$

(56)

$$\frac{9}{7} \div \frac{5}{12} = \frac{9}{7} \times \frac{12}{5} = \frac{108}{35} = 3\frac{3}{5}$$

(57)

$$\frac{2}{3} \div \frac{2}{3} = \frac{2}{3} \times \frac{3}{2} = \frac{6}{6} = 1\frac{1}{2}$$

(58)

$$1\frac{1}{2} \div \frac{2}{7} = \frac{3}{2} \times \frac{7}{2} = 6 \text{ gal.}$$

(59)

$$2\frac{1}{4} \div \frac{7}{9} = \frac{25 \div 7}{4 \div 9} = \frac{5}{8}$$

(60)

$$15\frac{3}{4} \div \frac{3}{4} = \frac{63}{4} \div \frac{3}{4} = 21$$

(61)

$$146 \div 5\frac{1}{2} = \frac{146}{1} \times \frac{2}{11} = 27\frac{3}{11}$$

(62)

$$520\frac{1}{2} \div 36\frac{2}{10} = \frac{2602}{5} \times \frac{5}{369} = \frac{578}{41} = 14\frac{4}{41}$$

(63)

$$\frac{1}{2} \div \frac{2}{3} \text{ of } \frac{7}{8} \text{ of } 121 = \frac{1}{2} \times \frac{3}{2} \times \frac{7}{8} \times \frac{8}{121} = \frac{21}{121}$$

(64)

$$\frac{1}{2} \div 7 = \frac{1}{14} = \frac{1}{14}$$



(65)

$$\frac{3}{7} \div 10\frac{1}{2} = \frac{3}{7} \times \frac{2}{21} = \frac{2}{49}$$

(66)

$$3 \div \frac{1}{4} = \frac{3}{1} \times \frac{4}{1} = \frac{12}{1} = 12$$

(67)

$$165\frac{3}{5} \div 8\frac{1}{2} = \frac{1485}{5} \times \frac{2}{17} = \frac{2970}{17} = 174\frac{6}{17} \text{ lb.}$$

(68)

$$138\frac{3}{4} \div 9\frac{3}{8} = \frac{111}{4} \times \frac{8}{75} = \frac{222}{15} = 14\frac{2}{3} \text{ bbl.}$$

(69)

$$3\frac{5}{8} \div 8 = \frac{32}{8} \div 8 = 4$$

(70)

$$7\frac{5}{8} \div 8 = \frac{61}{8} \div 8 = 7\frac{5}{64}$$

(71)

$$10\frac{3}{4} \div \frac{1}{2} = \frac{32}{4} \times \frac{5}{1} = \frac{40}{1} = 10$$

(72)

$$84\frac{7}{8} \div \frac{1}{5} = \frac{193}{16} \times \frac{9}{1} = \frac{1737}{16} = 108\frac{9}{16} \text{ bushels,}$$

(73)

$$5\frac{1}{8} \div 6\frac{1}{2} = \frac{61}{16} \times \frac{4}{27} = \frac{61}{108}$$

(74)

$$125\frac{1}{2} \div 31\frac{1}{4} = \frac{250}{2} \div \frac{250}{4} = 4 \text{ da.}$$

(75)

$$31\frac{1}{2} \div 1\frac{1}{2} = \frac{63}{2} \times \frac{2}{3} = \frac{42}{1} = 14 \text{ bottles,}$$

(76)

$$15\frac{3}{5} \div 11 = \frac{143}{5} \div 11 = \frac{13}{1} = 13 \text{ da.}$$

(77)

$$6 \div \frac{1}{4} = \frac{12}{1} \div \frac{1}{4} = 48$$

(78)

$$81 \div \frac{3}{4} = \frac{81}{1} \times \frac{4}{3} = 36; 36 \div 8 = 4\frac{1}{2} \text{ Ans.}$$

(79)

$$\frac{5}{8} \text{ of } \frac{40}{1} \div \frac{5}{9} = \frac{30}{1} \times \frac{9}{5} = 54; 54 \div 9 = 6 \text{ Ans.}$$

(80)

$$\frac{1}{3} \text{ of } \frac{21}{40} \div \frac{4}{5} = \frac{21}{2} \times \frac{5}{4} = \frac{105}{8} = 13\frac{1}{8}$$

(81)

$$4\frac{1}{2} \div 5\frac{1}{2} = \frac{22}{5} \times \frac{2}{11} = \frac{4}{5}$$

(82)

$$2540 \div \frac{3}{4} \text{ of } \frac{5}{9} = \frac{2540}{1} \times \frac{12}{5} = 6096 \text{ Ans.}$$

(83)

$$9\frac{1}{4} \div \frac{5}{7} \text{ of } \frac{2}{4} = \frac{131}{14} \times \frac{28}{15} = \frac{262}{15} = 17\frac{7}{15} \text{ weeks. Ans.}$$

## COMPLEX FRACTIONS.

(1)

$$\frac{5}{8} = \frac{5}{8} \div \frac{4}{5} = \frac{5}{8} \times \frac{5}{4} = \frac{25}{32} = 1\frac{1}{32}$$

(2)

$$\frac{8}{16} = \frac{8}{9} \div 1\frac{5}{8} = \frac{8}{9} \times \frac{8}{13} = \frac{64}{117}$$

(3)

$$\frac{15}{16} = \frac{14}{9} \div \frac{9}{16} = \frac{14}{9} \times \frac{16}{9} = \frac{224}{81} = 2\frac{62}{81}$$

(4)

$$\frac{87\frac{1}{2}}{\frac{1}{8}} = \frac{25}{2} \times \frac{4}{7} = 100$$

$$(5) \quad \frac{\frac{8}{9}}{4\frac{1}{2}} = \frac{8}{9} \div \frac{9}{2} = \frac{8}{9} \times \frac{2}{9} = \frac{16}{81}$$

$$(6) \quad \frac{8\frac{1}{2}}{12} = \frac{17}{2} \div \frac{12}{1} = \frac{17}{2} \times \frac{1}{12} = \frac{17}{24}$$

$$(7) \quad \frac{11\frac{3}{4}}{8\frac{7}{8}} = \frac{45\frac{3}{4}}{32} \div \frac{7}{8} = \frac{183}{128} \div \frac{7}{8} = \frac{183}{128} \times \frac{8}{7} = \frac{183}{112}$$

$$(8) \quad \frac{20}{\frac{4}{7}} = 20 \div \frac{4}{7} = \frac{20}{1} \times \frac{7}{4} = 35$$

$$(9) \quad \frac{\frac{5}{11} \text{ of } 7\frac{3}{11}}{\frac{4}{11} \text{ of } 17\frac{3}{7}} = \frac{\frac{5}{11} \text{ of } \frac{80}{11}}{\frac{4}{11} \text{ of } \frac{122}{7}} = \frac{400}{121} \div \frac{488}{77} = \frac{400}{121} \times \frac{77}{488} = \frac{250}{148}$$

$$(10) \quad \frac{26\frac{8}{15}}{\frac{2}{3} \text{ of } 17} = \frac{400}{33} \div \frac{2}{3} = \frac{400}{33} \times \frac{3}{2} = \frac{200}{11} = 18\frac{2}{11}$$

$$(11) \quad \frac{55\frac{1}{2}}{\frac{1}{8} \text{ of } 8\frac{1}{2}} = \frac{111}{2} \div \frac{1}{8} = \frac{111}{2} \times \frac{8}{1} = 444$$

$$(12) \quad \frac{\frac{5}{8} \text{ of } \frac{3}{16} \text{ of } \frac{9\frac{1}{2}}{13}}{\frac{1}{8} \text{ of } \frac{3}{16} \text{ of } \frac{3}{4} \div \frac{1}{1}} = \frac{5}{8} \text{ of } \frac{3}{16} \text{ of } \frac{19}{26} \div \frac{1}{1} = \frac{5}{8} \text{ of } \frac{3}{16} \text{ of } \frac{19}{26} \times \frac{1}{1} = \frac{5}{8} \text{ of } \frac{3}{16} \text{ of } \frac{19}{26}$$

## APPLICATIONS IN FRACTIONS.

(1)

$$\frac{1}{\frac{6}{2}} \text{ of } \frac{3}{7} \text{ of } \frac{4}{5} \text{ of } \frac{50}{1} \times \frac{21}{4} = \$15$$

(2)

$$6\frac{3}{5} \div \frac{2}{3} = \frac{33}{5} \times \frac{8}{3} = \frac{88}{5} = \$17\frac{3}{5}$$

(3)

$$77\frac{1}{2} \div 10\frac{1}{2} = \frac{155}{2} \div \frac{21}{2} = \frac{155}{21} \times \frac{2}{21} = \frac{258}{35} = 7\frac{3}{5} \text{ miles. Ans.}$$

(4)

$$\frac{2}{3} \times 11\frac{1}{3} = \frac{62}{3}; \frac{62}{3} - \frac{6}{13} = \frac{804}{39} - \frac{12}{39} = \frac{792}{39}$$

$$\frac{792}{39} \times 20\frac{1}{2} = \frac{792}{39} \times \frac{83}{2} = \frac{29963}{702} = 42\frac{47}{63} \text{ Ans.}$$

(5)

$$\frac{1}{3} + \frac{1}{3} + \frac{1}{4} + \frac{1}{5} = \frac{105}{315} + \frac{63}{315} + \frac{45}{315} + \frac{35}{315} = \frac{248}{315} = \text{sum};$$

$$\frac{3}{4} \text{ of } \frac{62}{105} = \frac{62}{105}; \frac{1}{4} + \frac{1}{4} + \frac{1}{8} = \frac{6}{24} + \frac{4}{24} + \frac{3}{24} = \frac{13}{24};$$

$$\frac{62}{105} - \frac{13}{24} = \frac{1488}{2520} - \frac{1365}{2520} = \frac{123}{2520} = \frac{41}{840} \text{ Ans.}$$

(6)

$$7\frac{1}{2} \div \frac{2}{3} = \frac{19}{2} \times \frac{3}{2} = \frac{57}{4} \text{ cost of one ton;}$$

$$\frac{95}{8} \times \frac{5}{9} = \frac{475}{18} = \$26\frac{7}{18} \text{ Ans.}$$

$$(7) \quad \frac{3}{8} \div \frac{7}{8} = \frac{3}{8} \times \frac{8}{7} = \frac{3}{1} \text{ price of 1 yd. ; } \frac{30}{7} \div \frac{1}{2} = \frac{30}{7} \times \frac{2}{1} = 15 \text{ yd.}$$

$$(8) \quad 4\frac{2}{3} \times 3\frac{1}{2} = \frac{14}{3} \times \frac{7}{2} = \frac{49}{3} = 16\frac{1}{3}$$

$$(9) \quad 6\frac{2}{3} \div \frac{1}{2} = \frac{20}{3} \times \frac{2}{1} = \frac{40}{3} = 33\frac{1}{3} \text{ pk.} = 8 \text{ bu. } 1\frac{1}{3} \text{ pk.}$$

$$(10) \quad \begin{array}{rcl} \frac{3}{4} \text{ league} & = & 2 \text{ mi. } 0 \text{ fur. } 0 \text{ rd.} \\ \frac{7}{10} \text{ mile} & = & \frac{5 \text{ " } 24 \text{ "}}{1 \text{ mi. } 2 \text{ fur. } 16 \text{ rd.}} \end{array}$$

$$(11) \quad \begin{array}{rcl} 4\frac{2}{10} \text{ mi.} & = & 4 \text{ mi. } 7 \text{ fur. } 8 \text{ rd.} \\ \frac{3}{4} \text{ fur.} & = & 11 \text{ rd. } 2 \text{ yd. } 1\frac{1}{4} \text{ ft.} \\ \frac{2}{3} \text{ of } 1\frac{1}{2} \text{ yd.} & = & \frac{2 \frac{7}{10} \text{ ft.}}{4 \text{ mi. } 7 \text{ fur. } 19 \text{ rd. } 3 \text{ yd. } 0\frac{2}{3} \frac{7}{10} \text{ ft.}} \end{array}$$

$$(12) \quad 36\frac{2}{3} \div 1\frac{1}{2} = \frac{108}{3} \div \frac{3}{2} = 20\frac{1}{3} \text{ days.}$$

$$(13) \quad 4\frac{1}{2} \times 5\frac{1}{2} = \$22, \text{ value of cloth ; } 22 \div 1\frac{1}{4} = \frac{154}{11} \div \frac{1}{4} = 14 \text{ da.}$$

$$(14) \quad 100 \div 14\frac{2}{3} = \frac{300}{4} \div \frac{4}{3} = \frac{75}{1} = \text{remainder ; } 27\frac{2}{3} - \frac{7}{3} = \frac{11}{1} - \frac{7}{1} = \frac{4}{1} = \frac{1221}{11} - \frac{300}{11} = \frac{921}{11} = 20\frac{1}{11} = \text{subtrahend or number.}$$

(15)

$\frac{3}{7}$  of \$6300 = \$2700, A's share;  $\frac{1}{3}$  of \$6300 = \$2800, B's share;  
 $2700 + 2800 = \$5500$ ;  $6300 - 5500 = \$800$ , C's share. *Ans.*

(16)

$\frac{3}{4} - \frac{3}{5} = \frac{3}{20}$ ;  $1 - \frac{3}{20} = \frac{17}{20}$ ; since 1 diminished by  $\frac{3}{20}$  of itself leaves  $\frac{17}{20}$  of itself, *any number* diminished by  $\frac{3}{20}$  of itself will leave  $\frac{17}{20}$  of itself; hence, 34 is  $\frac{17}{20}$  of the required number;

$$34 \div \frac{17}{20} = 40 \text{ Ans.}$$

(17)

$\frac{2}{3}$ of £15	= £4	5s.	8d.	$2\frac{2}{7}$ far.
£3 $\frac{3}{7}$	= £3	8s.	6d.	$3\frac{3}{7}$ "
$\frac{1}{8}$ of $\frac{5}{7}$ of $\frac{3}{5}$ of £1 =		2s.	10d.	$1\frac{1}{7}$ "
$\frac{3}{8}$ of $\frac{3}{7}$ of a shilling =			3d.	$1\frac{5}{7}$ "
	<hr/>			
	£7	17s.	5d.	$0\frac{4}{7}$ far. <i>Ans.</i>

(18)

John's marbles are  $\frac{6}{8}$  of James' marbles, and all the marbles will be  $\frac{14}{8}$  of James'; of these 14 parts, John must have 6, and James 8 of them; John has  $\frac{6}{14}$  of 56 = 24, and James,  $\frac{8}{14}$  of 56 = 32.

(19)

$\frac{3}{7}$  of 2000 =  $857\frac{1}{7}$  acres;  $\frac{2}{3}$  of  $857\frac{1}{7}$  =  $571\frac{3}{7}$  acres sold;  
 $857\frac{1}{7} - 571\frac{3}{7} = 285\frac{5}{7}$  acres retained. *Ans.*

(20)

$\frac{1}{3}$  of 240 = 80, A's;  $\frac{1}{6}$  of 240 = 40, B's;  $\frac{1}{8}$  of 240 = 30, C's;  
 $\frac{1}{6}$  of 240 = 40, D's;  $80 + 40 + 30 + 40 = 190$ ;  $240 - 190 = 50$ , the remainder.

(21)

$\frac{1}{3}$  of 3740 = \$1246 $\frac{2}{3}$ ;  $1246\frac{2}{3} + 156\frac{1}{3} = \$1403$ , whole gain;  
 $\$1403 \div 3 = \$467\frac{2}{3}$ , annual gain. *Ans.*

(22)

$\frac{2}{4} + \frac{7}{8} = \frac{13}{8} = \$1\frac{5}{8}$ , what they gave for it;  $1\frac{5}{8} + \frac{7}{8} = \$2\frac{1}{8}$ ,  
 what they sold it for; the first paid 6 parts as often as the  
 second paid 7 parts; therefore, the first must have  $\frac{6}{13}$  of  
 $\frac{7}{8} = \$2\frac{42}{88}$ ; and the second  $\frac{7}{13}$  of  $\frac{7}{8} = \$2\frac{49}{88}$  *Ans.*

(23)

$\frac{1}{3}$  of  $126\frac{6}{7} = 79\frac{2}{7}$  bushels;  $79\frac{2}{7} \times \$2\frac{1}{2} = \$174\frac{2}{7}$ ;  
 $126\frac{6}{7} - 79\frac{2}{7} = 47\frac{4}{7}$  bushels;  $47\frac{4}{7} \times 1\frac{3}{4} = \frac{83\frac{1}{2}}{\$257\frac{1}{2}}$  *Ans.*

(24)

$1\frac{1}{2} + \frac{2}{4} = \frac{5}{2} = \$2\frac{1}{2}$ ;  $19\frac{1}{8} \div 2\frac{1}{2} = 7\frac{1}{2}$  bushels. *Ans.*

(25)

$\$492\frac{2}{3} = \frac{2}{12}$  of the capital;  $\$492\frac{2}{3} \div 2 = \$246\frac{1}{3}$ , which is  $\frac{1}{12}$   
 of the capital;  $\$246\frac{1}{3} \times 7 = \$1724\frac{1}{3}$ , A's share;  $\$246\frac{1}{3} \times$   
 $5 = \$1231\frac{2}{3}$ , B's share. *Ans.*

(26)

$63 \div \frac{7}{8} = 72$ , what he had in the second field;  $\frac{5}{3}$  of 72 = 120;  
 $120 \div 4 = 30$ , what he had in the third field;  $63 + 72 +$   
 $30 = 165$  sheep. *Ans.*

## DUODECIMALS.

## ADDITION AND SUBTRACTION.

$$\begin{array}{ll} (1) & (2) \\ 86' \div 12 = 7 \text{ ft. } 2' & 750'' \div 12 = 62' 6''; 62' 6'' \div 12 = 5 \text{ ft. } 2' 6'' \end{array}$$

$$\begin{array}{ll} (3) & (4) \\ 37000''' \div 12 = 3083'' 4'''; & 67' \div 12 = 5 \text{ ft. } 7' \text{ Ans.} \\ 3083'' \div 12 = 256' 11''; & \\ 256' \div 12 = 21 \text{ ft. } 4'; & \\ 21 \text{ ft. } 4' 11'' 4''' \text{ Ans.} & \end{array}$$

$$\begin{array}{l} (5) \\ 470''' \div 12 = 39'' 2'''; \\ 39'' \div 12 = 3' 3''; \\ 3' 3'' 2''' \text{ Ans.} \end{array}$$

$$\begin{array}{l} (6) \\ 375'' \div 12 = 31' 3''; \\ 31' \div 12 = 2 \text{ ft. } 7'; \\ 2 \text{ ft. } 7' 3'' \text{ Ans.} \end{array}$$

$$\begin{array}{l} (7) \\ 8 \text{ ft. } 9' 7'' \\ 6 \text{ ft. } 7' 3'' 4''' \\ \hline 15 \text{ ft. } 4' 10'' 4''' \text{ Ans.} \end{array}$$

$$\begin{array}{l} (8) \\ 32 \text{ ft. } 6' 6'' 0''' \\ 29 \text{ ft. } 0' 0' 7''' \\ \hline 3 \text{ ft. } 6' 5'' 5''' \text{ Ans.} \end{array}$$

$$\begin{array}{l} (9) \\ 9 \text{ ft. } 6' 4'' 3''' \\ 12 \quad 2 \quad 9 \quad 10 \\ 26 \quad 0 \quad 5 \\ 40 \quad 1 \quad 0 \quad 3 \\ \hline 87 \text{ ft. } 10' 7'' 4''' \text{ Ans.} \end{array}$$

$$\begin{array}{l} (10) \\ 125 \text{ ft. } 0' 6'' 0''' \\ 45 \quad 11 \quad 0 \quad 2 \\ 12 \quad 6 \\ \hline 183 \text{ ft. } 5' 6'' 2''' \text{ Ans.} \end{array}$$



$$\begin{array}{r}
 (11) \\
 84 \text{ ft. } 7' 0'' 0''' \\
 96 \quad 0 \ 11 \ 0 \\
 42 \quad 6 \ 9 \ 10 \\
 \hline
 \quad 5 \ 7 \ 11
 \end{array}$$

223 ft. 8' 4'' 9''' *Ans.*

$$\begin{array}{r}
 (13) \\
 425 \text{ ft. } 9' 10'' 0''' \\
 107 \quad 10 \ 9 \ 8 \\
 \hline
 317 \text{ ft. } 11' 0'' 4''' \text{ *Ans.*}
 \end{array}$$

$$\begin{array}{r}
 (12) \\
 127 \text{ ft. } 3' 6'' 4''' 11'''' \\
 40 \quad 0 \ 10 \ 7 \ 5 \\
 \hline
 87 \text{ ft. } 2' 7'' 9''' 6'''' \text{ *A.*}
 \end{array}$$

$$\begin{array}{r}
 (14) \\
 325 \text{ ft. } 7' 6'' 2''' \\
 217 \quad 10 \ 9 \ 0 \\
 \hline
 543 \text{ ft. } 6' 3'' 2''' \text{ sum.} \\
 107 \text{ ft. } 8' 9'' 2''' \text{ diff.}
 \end{array}$$

## MULTIPLICATION.

$$\begin{array}{r}
 (1) \\
 12 \text{ ft. } 6' \\
 1 \quad 5 \\
 \hline
 5 \text{ ft. } 2' 6'' \\
 12 \quad 6 \\
 \hline
 17 \text{ ft. } 8' 6'' \\
 2 \quad 4 \\
 \hline
 5 \text{ ft. } 10' 10'' \\
 35 \quad 5 \ 0 \\
 \hline
 41 \text{ cu. ft. } 3' 10''
 \end{array}$$

$$\begin{array}{r}
 (2) \\
 9 \text{ ft. } 6' \\
 4 \quad 7 \\
 \hline
 5 \text{ ft. } 6' 6'' \\
 38 \quad 0 \\
 \hline
 43 \text{ sq. ft. } 6' 6''
 \end{array}$$

$$\begin{array}{r}
 (3) \\
 12 \text{ ft. } 5' \\
 6 \quad 8 \\
 \hline
 8 \text{ ft. } 3' 4'' \\
 74 \quad 6 \\
 \hline
 82 \text{ sq. ft. } 9' 4''
 \end{array}$$

$$\begin{array}{r}
 (4) \\
 35 \text{ ft. } 4' 6'' \\
 9 \quad 10 \\
 \hline
 29 \text{ ft. } 5' 9'' \\
 318 \quad 4 \\
 \hline
 347 \text{ sq. ft. } 10' 8''
 \end{array}$$

$$\begin{array}{r}
 (5) \\
 45 \text{ ft. } 4' 3'' \\
 12 \quad 2 \ 9 \\
 \hline
 2 \text{ ft. } 10' 0'' 2''' 3'''' \\
 7 \quad 6 \ 8 \ 6 \\
 \hline
 544 \quad 3 \ 0 \\
 \hline
 554 \text{ sq. ft. } 7' 8'' 8''' 3''''
 \end{array}$$

$$\begin{array}{r}
 \text{(6)} \\
 \begin{array}{r}
 140 \text{ ft.} \quad 0' \quad 2'' \quad 4''' \\
 \underline{20 \quad 10} \\
 116 \text{ ft.} \quad 8' \quad 1'' \quad 11''' \quad 4'''' \\
 2800 \quad 3 \quad 10 \quad 8 \\
 \hline
 2917 \text{ sq. ft.} \quad 0' \quad 0'' \quad 7''' \quad 4''''
 \end{array}
 \end{array}$$

$$\begin{array}{r}
 \text{(7)} \\
 \begin{array}{r}
 279 \text{ ft.} \quad 10' \quad 6'' \\
 \underline{\quad 8 \quad 4} \\
 7 \text{ ft.} \quad 9' \quad 3'' \quad 6''' \\
 186 \quad 7 \quad 0 \quad 0 \\
 \hline
 194 \text{ sq. ft.} \quad 4' \quad 3'' \quad 6'''
 \end{array}
 \end{array}$$

$$\begin{array}{r}
 \text{(8)} \\
 \begin{array}{r}
 14 \text{ ft.} \quad 6' \quad 3'' \\
 \underline{2 \quad 9} \\
 10 \text{ ft.} \quad 10' \quad 8'' \quad 3''' \\
 29 \quad 0 \quad 6 \\
 \hline
 39 \text{ sq. ft.} \quad 11' \quad 2'' \quad 3'''
 \end{array}
 \end{array}$$

$$\begin{array}{r}
 \text{(9)} \\
 \begin{array}{r}
 18 \text{ ft.} \quad 9' \\
 \underline{15 \quad 10} \\
 15 \text{ ft.} \quad 7' \quad 6'' \\
 281 \quad 3 \\
 \hline
 296 \text{ sq. ft.} \quad 10' \quad 6''
 \end{array}
 \end{array}$$

$$\begin{array}{r}
 \text{(10)} \\
 \begin{array}{r}
 70 \text{ ft.} \quad 9' \\
 \underline{12 \quad 3} \\
 17 \text{ ft.} \quad 8' \quad 3'' \\
 849 \quad 0 \\
 \hline
 9)866 \text{ sq. ft.} \quad 8' \quad 3'' \\
 \hline
 96 \text{ sq. yd.} \quad 2 \text{ sq. ft.} \quad 8' \quad 3''
 \end{array}
 \end{array}$$

$$\begin{array}{r}
 \text{(11)} \\
 \begin{array}{r}
 75 \\
 \underline{42} \\
 3150 \text{ sq. ft.}
 \end{array}
 \end{array}$$

$$\begin{array}{r}
 \text{(12)} \\
 \begin{array}{r}
 118 \\
 \underline{25} \\
 9)2950 \text{ sq. ft.} \\
 \hline
 327\frac{7}{9} \text{ sq. yd.}
 \end{array}
 \end{array}$$

$$\begin{array}{r}
 \text{(13)} \\
 \begin{array}{r}
 18 \text{ ft.} \quad 0' \\
 14 \text{ in.} = 1 \text{ ft.} \quad 2' \\
 \hline
 3 \text{ ft.} \quad 0' \\
 \underline{18} \\
 21 \text{ sq. ft.}
 \end{array}
 \end{array}$$

$$\begin{array}{c}
 \text{(14)} \\
 27 \times 22 = 594 \text{ sq. ft.} = 66 \text{ sq. yd.} = \text{square measure of the side;} \\
 .40 \times 66 = \$26.40 \text{ Ans.}
 \end{array}$$

(15)

$$45 \times 37 = 1665 \text{ sq. rd.} = 10 \text{ A. } 1 \text{ R. } 25 \text{ P. } \textit{Ans.}$$

(16)

$$\begin{array}{r} 112 \text{ ft. } 5' \\ 27 \quad 9 \\ \hline 84 \text{ ft. } 3' 9'' \\ 3035 \quad 3 \\ \hline 3119 \text{ sq. ft. } 6' 9'' \end{array}$$

(17)

$$\begin{array}{l} 4 \text{ ft. } 6' \times 4 \text{ ft.} = 18 \text{ sq. ft.} = \text{sq. meas. of stone,} \\ 6 \text{ ft. } 9' \times 264 = 1782 \text{ sq. ft.} = \text{sq. meas. of walk,} \\ 1782 \div 18 = 99 \text{ stones. } \textit{Ans.} \end{array}$$

(18)

$$\begin{array}{r} 64 \text{ ft. } 6' \\ 64 \quad 6 \\ \hline 32 \text{ ft. } 3' 0'' \\ 4128 \\ \hline 4160 \text{ sq. ft. } 3' 0'' \\ 4160 \text{ sq. ft. } 3' = 4160 \frac{1}{4} \text{ sq. ft.;} \\ 4160 \frac{1}{4} \times .05 = \$208.01 \frac{1}{4} \end{array}$$

(19)

$$\begin{array}{r} 6 \text{ ft. } 9' \\ 4 \quad 8 \\ \hline 4 \text{ ft. } 6' \\ 27 \quad 0 \\ \hline 31 \text{ ft. } 6' \\ 2 \quad 10 \\ \hline 26 \text{ ft. } 3' \\ 63 \quad 0 \\ \hline 89 \text{ cu. ft. } 3' \end{array}$$

(20)

$$\begin{array}{r} 97 \text{ ft. } 4' \\ 9 \quad 6 \\ \hline 876 \text{ ft. } 0' \\ 48 \quad 8 \\ \hline 924 \text{ sq. ft. } 8' \\ 924 \frac{2}{3} \text{ sq. ft. } \div 9 = 102 \frac{2}{3} \text{ sq. yd.;} \\ 102 \frac{2}{3} \times .18 = \$18.49 \frac{1}{3} \text{ } \textit{Ans.} \end{array}$$

(21)

$$\begin{array}{l} 18 \times 7 \times 4 = 504 \text{ cu. ft.} \\ 504 \div 128 = 3 \frac{1}{8} \text{ cords.} \end{array}$$

(22)

$$\begin{array}{l} 48 \times 9 \times 3 \frac{1}{2} = 1512 \text{ cu. ft.} \\ 1512 \div 128 = 11 \frac{3}{8} \text{ cords.} \end{array}$$

(23)

$$\begin{array}{l} 21 \frac{1}{2} \times 15 \times 10 = 3225 \text{ cu. ft.} = 5572800 \text{ cu. in.;} \\ 5572800 \div 231 = 24124 \frac{5}{7} \text{ gal.} \end{array}$$

(24)

12 ft.	4'	$8 \times 4 \times 2 = 64$ cu. in. = contents of a brick ;
8		$1554 \times 1728 = 2685412$ cu. in., in pile ;
98 sq. ft.	8'	$2685412 \div 64 = 41958$ bricks. <i>Ans.</i>
15 "	9'	
<hr/>		
1554 cu. ft.		

(25)

The long side of the ditch =  $240 \text{ ft.} + 7 \text{ ft.} = 247 \text{ ft.}$ , and  
the short side =  $164 \text{ ft.}$ ; the whole length of the ditch is  
 $247 \times 2 + 164 \times 2 = 822 \text{ ft.}$ ;  $822 \times 3\frac{1}{2} \times 6\frac{1}{2} = 19419\frac{1}{2}$   
cubic feet.

(26)

36 ft.	5'
6	8
<hr/>	
24 ft.	3' 4"
218	6
<hr/>	
242 ft.	9' 4"
3	6
<hr/>	
121 ft.	4' 8"
728	4 0
<hr/>	
849 cu. ft.	8' 8"

(27)

26 ft.	8'	$563 \div 128 = 4 \text{ C. } 51 \text{ cu. ft.}$
6	6	$51 \text{ ft. } 4' = 616'$
<hr/>		
13 ft.	4'	$1 \text{ C.} = 128 \text{ c. ft.} = 1536'$
160	0	$51 \text{ ft. } 4' = \frac{616}{128} = 4\frac{7}{8} \text{ C.}$
<hr/>		
173 ft.	4'	$4\frac{7}{8} \times 3.50 = \$15.40\frac{5}{8}$
3	3	
<hr/>		
43 ft.	4'	
520	0	
<hr/>		
563 cu. ft.	4'	

(28)

38 ft.	10'	$7430 \div 27 = 275 \text{ cu. yd. } 5 \text{ cu. ft.}$
20	6	$5 \text{ cu. ft. } 1' 4'' = 736''$
<hr/>		
19 ft.	5'	$1 \text{ cu. yd. } 27 \text{ cu. ft.} = 3888''$
776	8	$5 \text{ cu. ft. } 1' 4'' = \frac{736}{27} = 27\frac{4}{3} \text{ cu. yd.}$
<hr/>		
796 ft.	1'	$7430 \text{ cu. ft. } 1' 4'' = 275\frac{46}{27} \text{ cu. yd}$
9	4	
<hr/>		
265 ft.	4' 4"	
7164	9	
<hr/>		
7430 cu. ft.	1' 4"	

(29)

22 ft.	8'	22 ft.	8'
22	8	18	9
18	9	<hr/>	
18	9	425 sq. ft.	0' ceiling.
<hr/>		139 sq. ft.	4' windows
82 ft.	10'	47	6 doors.
11	6	76	6 base.
<hr/>		<hr/>	
911 ft.	2'	263 sq. ft.	4'
41	5		
<hr/>			
952 sq. ft.	7'	sides of the room.	
425	0	ceiling of the room.	
<hr/>			
1377 sq. ft.	7'		
263	4		
<hr/>			
9)1114 sq. ft.	3'		
<hr/>			
123 $\frac{2}{3}$ sq. yd.; 123 $\frac{2}{3}$ $\times$ 16 = \$19.80 $\frac{2}{3}$ <i>Ans.</i>			

## DIVISION.

(1)

6 ft. 4')	29 sq. ft.	0'	4''	(4 ft. 7' <i>Ans.</i>
25	4	<hr/>		
3 sq. ft.	8'	4''		
3	8	4	<hr/>	

(2)

9 ft. 6')	50 ft.	0'	10''	6'''	(5 ft. 3' 3'' <i>Ans.</i>
47	6	<hr/>			
2	6'	10''			
2	4	6	<hr/>		
2'	4''	6'''			
2	4	6	<hr/>		

(3)

$$\begin{array}{r}
 24 \text{ ft. } 3') 1176 \text{ sq. ft. } 1' \quad 6'' (48 \text{ ft. } 6' \text{ Ans.} \\
 \underline{1164} \qquad \qquad \qquad 0 \\
 12 \qquad \qquad \qquad 1' \quad 6'' \\
 \underline{12} \qquad \qquad \qquad 1 \quad 6
 \end{array}$$

(4)

$$\begin{array}{r}
 3 \text{ ft. } 4') 119 \text{ cu. ft. } 2' \quad 6'' \quad 8''' (35 \text{ sq. ft. } 9' \quad 2'' \\
 \underline{116} \qquad \qquad \qquad 8' \\
 2 \qquad \qquad \qquad 6' \quad 6'' \\
 \underline{2} \qquad \qquad \qquad 6 \quad 0 \\
 \qquad \qquad \qquad \qquad \qquad 6'' \quad 8''' \\
 \qquad \qquad \qquad \qquad \qquad \underline{6 \quad 8}
 \end{array}$$

$$\begin{array}{r}
 4 \text{ ft. } 2') 35 \text{ sq. ft. } 9' \quad 2'' (8 \text{ ft. } 7' \text{ Ans.} \\
 \underline{33} \qquad \qquad \qquad 4' \\
 2 \qquad \qquad \qquad 5' \quad 2'' \\
 \underline{2} \qquad \qquad \qquad 5 \quad 2
 \end{array}$$

(5)

$$\begin{array}{r}
 3 \text{ ft. } 9') 105 \text{ cu. ft. } 5' \quad 7'' \quad 6''' (28 \text{ ft. } 1' \quad 6'' \\
 \underline{105} \qquad \qquad \qquad 0' \\
 \qquad \qquad \qquad 5' \quad 7'' \\
 \qquad \qquad \qquad \underline{3 \quad 9} \\
 \qquad \qquad \qquad 1' \quad 10'' \quad 6''' \\
 \qquad \qquad \qquad \underline{1 \quad 10 \quad 6}
 \end{array}$$

$$\begin{array}{r}
 2 \text{ ft. } 3') 28 \text{ sq. ft. } 1' \quad 6'' (12 \text{ ft. } 6' \text{ Ans.} \\
 \underline{27} \qquad \qquad \qquad 0' \\
 1 \qquad \qquad \qquad 1' \quad 6'' \\
 \underline{1} \qquad \qquad \qquad 1 \quad 6
 \end{array}$$

(6)

$$10 \text{ ft. } 7' \overline{) 394 \text{ sq. ft.}} \quad 2' \quad 9'' (37 \text{ ft. } 3' \text{ Ans.}$$

$$\begin{array}{r} 391 \\ 2 \quad 7' \quad 9'' \\ 2 \quad 7 \quad 9 \end{array}$$

(7)

$$17 \text{ ft. } 6' \overline{) 27 \text{ sq. ft.}} \quad 8' \quad 6'' (1 \text{ ft. } 7' \text{ Ans.}$$

$$\begin{array}{r} 17 \\ 10 \quad 2' \quad 6'' \\ 10 \quad 2 \quad 6 \end{array}$$

(8)

$$158 \text{ cu. yd. } 17 \text{ cu. ft. } 4'$$

27

$$42 \text{ ft. } 10' \overline{) 4283 \text{ cu. ft.}} \quad 4' (100 \text{ sq. ft.}$$

4283

4

$$12 \text{ ft. } 6' \overline{) 100 \text{ ft.}} \quad 0' (8 \text{ ft. } \text{Ans.}$$

$$\begin{array}{r} 100 \\ 0 \end{array}$$

(9)

$$4 \text{ ft. } 8'$$

$$\begin{array}{r} 2 \quad 10 \end{array}$$

$$\begin{array}{r} 3 \quad 10' \quad 8'' \\ 9 \quad 4 \end{array}$$

13 sq. ft.  $2' \quad 8''$  = product of two dimensions.

$$13 \text{ sq. ft. } 2' \quad 8'' \overline{) 86 \text{ cu. ft.}} \quad 2' \quad 7'' \quad 9''' \quad 6'''' (6 \text{ ft. } 6' \quad 3' \quad 1'' \quad 3'' \quad 2''$$

79

4 \quad 0

$$\begin{array}{r} 6 \quad 10' \quad 7'' \quad 9''' \\ 6 \quad 7 \quad 4 \quad 0 \end{array}$$

$$\begin{array}{r} 3' \quad 3'' \quad 9''' \quad 6'''' \\ 3 \quad 3 \quad 8 \quad 0 \end{array}$$

$$\begin{array}{r} 1''' \quad 6'''' \end{array}$$

$$1''' \quad 6'''' = 18''''$$

$$13 \text{ sq. ft. } 2'' \quad 8'' = 274176''''$$

$$1''' \quad 6'''' \div 13 \text{ sq. ft. } 2' \quad 8'' = \frac{18}{274176} = \frac{1}{15232}$$

## DECIMAL FRACTIONS.

(1)	(2)	(3)
.06 <i>Ans.</i>	1.7 <i>Ans.</i>	.005 <i>Ans.</i>

(4)	(5)	(6)
.27 <i>Ans.</i>	.047 <i>Ans.</i>	6.41 <i>Ans.</i>

(7)	(8)	(9)	(10)
7.008 <i>Ans.</i>	9.05 <i>Ans.</i>	11.50 <i>Ans.</i>	44.7 <i>Ans.</i>

(1)	(2)	(3)
27.4 <i>Ans.</i>	36.015 <i>Ans.</i>	99.0027 <i>Ans.</i>

(4)	(5)	(6)
.320 <i>Ans.</i>	200.000320 <i>Ans.</i>	.3600 <i>Ans.</i>

(7)	(8)	(9)
5.000003 <i>Ans.</i>	40.0000009 <i>Ans.</i>	.4900 <i>Ans.</i>

(10)	(11)	(12)
59.0067 <i>Ans.</i>	.0469	79.000415 <i>Ans.</i>

(13)	(14)	(15)
67.0227 <i>Ans.</i>	105.0000095 <i>Ans.</i>	40.204000 <i>Ans.</i>

(1)	(2)	(3)	(4)
\$37.265 <i>A.</i>	\$17.005 <i>A.</i>	\$215.08 <i>A.</i>	\$275.005 <i>A.</i>

(5)	(6)	(7)	(8)
\$9.008 <i>A.</i>	\$15.069 <i>A.</i>	\$27.182 <i>A.</i>	\$3.059 <i>A.</i>



## ADDITION.

(1)	(2)	(3)
6.035	465.103113	57.406
763.196	.78012	97.004
445.3741	1.34976	4.6
91.5754	.3549	.06
<u>1306.1805</u> <i>Ans.</i>	<u>.61.11</u>	<u>.3</u>
	528.697893 <i>Ans.</i>	159.370 <i>Ans.</i>

(4)	(5)	(6)	(7)
.0009	.0049	5.714	3.754
1.0436	49.0426	3.456	47.5
.4	37.0410	.543	.00857
.05	360.0039	17.4957	37.5
<u>.047</u>	<u>446.0924</u>	<u>27.2087</u>	<u>88.76257</u>
1.5415			

(8)	(9)	(10)
54.34	71.25	375.94
.375	1.749	5.732
14.795	1759.5	14.375
<u>1.5</u>	<u>3.1</u>	<u>1.5</u>
71.010	1835.599	397.547

(11)	(12)	(13)
.005	90.00	2.025
.0057	.19	5.0027
31.008	.018	47.000126
<u>.00594</u>	<u>.00211</u>	<u>150.0000017</u>
31.02464	.000019	204.0278277
	90.210129	

(14)	(15)	(16)
.327	.05	25.126
.0056	.027	9.08
400.000084	.00476	12.74
.00001560	.0190	18.508
<u>400.33269960</u>	<u>.0001279</u>	<u>20.009</u>
	.1008879	\$85.463

(17)	(18)	(19)	(20)
126.90	1.025	225.50	9.375
420.756	.997	127.055	2.125
317.061	.88	<u>75.28</u>	1.625
<u>200.473</u>	<u>.9876</u>	\$427.835	<u>6.09</u>
\$1065.190	3.8896		\$19.215

(21)	(22)	(23)	(24)	(25)
296.75	16.408	99.875	97.004	37.874
126.125	4.875	87.078	25.019	50.009
97.375	6.00	59.44	65.956	19.046
100.10	2.378	60.506	4.878	<u>27.705</u>
<u>50.625</u>	<u>.625</u>	<u>21.303</u>	<u>55.154</u>	\$134.634
\$670.975	\$30.286	\$328.202	\$248.011	

## SUBTRACTION.

(1)	(2)	(3)
875.0500	410.0591	7141.60400
<u>.0467</u>	<u>41.496</u>	<u>.09046</u> ✓
875.0033	368.5631	7141.51354

(4)	(5)	(6)	(7)
57.490	3.0750	1745.30	.7000
<u>5.768</u>	<u>.3054</u>	<u>173.45</u>	<u>.0054</u>
51.722	2.7696	1571.85	.6946

$$\begin{array}{r}
 (8) \\
 1.00075 \\
 \underline{.105} \\
 .89575 \text{ Ans.}
 \end{array}$$

$$\begin{array}{r}
 (9) \\
 754.355 \\
 \underline{150.43} \\
 603.925 \text{ Ans.}
 \end{array}$$

$$\begin{array}{r}
 (10) \\
 1754.754 \\
 \underline{375.49478} \\
 1379.25922 \text{ Ans.}
 \end{array}$$

$$\begin{array}{r}
 (11) \\
 175.01 \\
 \underline{75.304} \\
 99.706
 \end{array}$$

$$\begin{array}{r}
 (12) \\
 35.49 \\
 \underline{17.541} \\
 17.949
 \end{array}$$

$$\begin{array}{r}
 (13) \\
 .7 \\
 \underline{.000007} \\
 .699993
 \end{array}$$

$$\begin{array}{r}
 (14) \\
 396. \\
 \underline{67.0008} \\
 328.9992
 \end{array}$$

$$\begin{array}{r}
 (15) \\
 1. \\
 \underline{.001} \\
 .999
 \end{array}$$

$$\begin{array}{r}
 (16) \\
 6374. \\
 \underline{59.1} \\
 6314.9
 \end{array}$$

$$\begin{array}{r}
 (17) \\
 365.0075 \\
 \underline{.000005} \\
 365.007495
 \end{array}$$

$$\begin{array}{r}
 (18) \\
 21.004 \\
 \underline{.0098} \\
 20.9942
 \end{array}$$

$$\begin{array}{r}
 (19) \\
 260.3609 \\
 \underline{.0000047} \\
 260.3608953
 \end{array}$$

$$\begin{array}{r}
 (20) \\
 10.0302 \\
 \underline{.000019} \\
 10.030181
 \end{array}$$

$$\begin{array}{r}
 (21) \\
 2.03 \\
 \underline{.0006} \\
 2.0294
 \end{array}$$

$$\begin{array}{r}
 (22) \\
 1000. \\
 \underline{.001} \\
 999.999
 \end{array}$$

$$\begin{array}{r}
 (23) \\
 2500. \\
 \underline{.25} \\
 2499.75
 \end{array}$$

$$\begin{array}{r}
 (24) \\
 200.027 \\
 \underline{97.0120} \\
 103.0150
 \end{array}$$

$$\begin{array}{r}
 (25) \\
 1. \\
 \underline{.5768} \\
 .4232
 \end{array}$$

$$\begin{array}{r}
 (26) \\
 \hline
 127.25 \quad 500. \\
 84.125 \quad \underline{328.075} \\
 116.7 \\
 \underline{\quad\quad\quad} \\
 328.075 \quad 171.925 \text{ acres.}
 \end{array}$$

$$\begin{array}{r}
 (27) \\
 700. \\
 \underline{617.375} \\
 \$82.625
 \end{array}$$

(28)

$$\begin{array}{r}
 \overbrace{\begin{array}{r} 325.50 \\ 97.125 \\ 60.875 \end{array}} \\
 \hline
 \$483.500
 \end{array}
 \qquad
 \begin{array}{r}
 510.10 \\
 483.50 \\
 \hline
 \$26.60
 \end{array}$$

(29)

$$\begin{array}{r}
 \overbrace{\begin{array}{r} 1.05 \\ 20.007 \\ 40.1255 \\ 37.00056 \end{array}} \\
 \hline
 98.18306
 \end{array}
 \qquad
 \begin{array}{r}
 225.025 \\
 98.18306 \\
 \hline
 126.84194
 \end{array}$$

(30)

$$\begin{array}{r}
 1240.06 \\
 1867.985 \\
 \hline
 3108.045 \\
 2346.865 \\
 \hline
 \$761.180
 \end{array}$$

## MULTIPLICATION.

(1)

$$\begin{array}{r}
 2.125 \\
 .375 \\
 \hline
 10625 \\
 14875 \\
 \hline
 6375 \\
 \hline
 .796875
 \end{array}$$

(2)

$$\begin{array}{r}
 .4712 \\
 5.6 \\
 \hline
 28272 \\
 23560 \\
 \hline
 2.63872
 \end{array}$$

(3)

$$\begin{array}{r}
 .0125 \\
 .004 \\
 \hline
 .0000500
 \end{array}$$

(4)

$$6.002 \times .25 = 1.50050$$

(5)

$$473.54 \times .057 = 26.99178$$

(6)

$$137.549 \times 75.437 = 10376.283913$$

(7)

$$8 \times .7495 \times 73487 = 165235.5195$$

(8)

$$.04375 \times .47134 = .0206211250$$

(9)

$$.371343 \times 75493 = 28033.797099$$

(10)

$$49.0754 \times 3.5714 = 175.26788356$$

( 11 )

$$.573005 \times .000754 = .000432045770$$

( 12 )

$$.375494 \times 577.75 = 216.94165850$$

( 13 )

$$.000294 \times .000001 = .000000000294$$

( 14 )

$$300.27 \times 62 = 18616.74$$

( 15 )

$$93.01401 \times 10.03962 = 933.8253150762$$

( 16 )

$$596.04 \times .000012 = .00715248$$

( 17 )

$$38049.079 \times .000016 = .608785264$$

( 18 )

$$1192.08 \times .000024 = .02860992$$

( 19 )

$$76098.158 \times .000032 = 2.435141056$$

( 20 )

$$36000 \times .036 = 1296$$

( 21 )

$$125000 \times .0025 = 312.5$$

( 22 )

$$50000 \times .0000075 = .375$$

( 23 )

$$.48 \times .0075 = .0036$$

( 24 )

$$16.25 \times 9.125 = 148.28125 \text{ sq. rd.}$$

( 25 )

$$12.07 \times 1.005 = 12.13035 \text{ sq. ft.}$$

( 26 )

$$.875 \times 27.5 = \$24.0625$$

( 27 )

$$25.125 \times 127.045 = \$3192.005625$$

( 28 )

$$11.75 \times 17875 = \$210.03125$$

( 29 )

$$35.08 \times 420.25 = \$14742.37, \text{ cost of farm ;}$$

$$37.50 \times 196.175 = \$7356.5625 \quad \}$$

$$36.128 \times 224.075 = \$8094.709375 \quad \}$$

$$\$15451.271875, \text{ price when sold.}$$

$$15451.271875 - 14742.37 = \$708.901875, \text{ gain. } \textit{Ans.}$$

37.5

27.35

( 30 )

$$64.85 \times 2.94 = \$190.6590 = \text{price obtained at sale ;}$$

$$37.5 \times 2.75 = \$103.125 \quad \}$$

$$27.35 \times 3.125 = \$85.46875 \quad \}$$

$$\$188.59375$$

$$190.6590$$

$$188.59375 = \text{cost ;}$$

$$\$2.06525 = \text{gain. } \textit{A.}$$

## CONTRACTIONS- IN MULTIPLICATION.

( 1 )

$$479.64 \times 10 = 4796.4 ; 479.64 \times 100 = 47964 \text{ } \textit{Ans.}$$

( 2 )

$$69.4729 \times 1000 = 69472.9 ; 69.4729 \times 10 = 694.729 \text{ } \textit{Ans.}$$

(3)

$$41.53 \times 10000 = 415300; 41.53 \times 100 = 4153 \text{ Ans.}$$

(4)

$$27.04 \times 100 = 2704; 27.04 \times 1000 = 27040 \text{ Ans.}$$

(5)

$$129.072 \times 1000 = 129072; 129.072 \times 10 = 1290.72 \text{ Ans.}$$

(6)

$$87.1 \times 10000 = 871000; 87.1 \times 100 = 8710 \text{ Ans.}$$

(7)

$$140.1 \times 1000 = 140100; 140.1 \times 10 = 1401 \text{ Ans.}$$

(2)

$$\begin{array}{r} 54.74943 \text{ } 67 \\ \underline{4.714753} \end{array}$$

$$21899775$$

$$3832461$$

$$54749$$

$$21900$$

$$3832$$

$$274$$

$$16$$

$$258.13007 \text{ Ans.}$$

(3)

$$\begin{array}{r} 475.710 \text{ } 564 \\ \underline{0.3416494} \end{array}$$

$$142713$$

$$19028$$

$$476$$

$$285$$

$$19$$

$$4$$

$$162.525 \text{ Ans.}$$

(4)

$$3754.4078$$

$$\underline{.734576}$$

$$262808546$$

$$11263223$$

$$1501763$$

$$187720$$

$$26280$$

$$2253$$

$$2757.89785 \text{ Ans.}$$

(5)

$$4745.679$$

$$\underline{751.4549}$$

$$4746$$

$$237284$$

$$3321975$$

$$1898$$

$$237$$

$$19$$

$$4$$

$$3566163 \text{ Ans.}$$

## DIVISION.

$$\begin{array}{r} \text{(1)} \\ 2.11 \overline{) 4.6842} \end{array} \begin{array}{l} (2.22 \text{ Ans.}) \\ 4 \ 22 \cdot \cdot \end{array}$$

$$\begin{array}{r} 464 \\ 422 \\ \hline 422 \\ 422 \\ \hline \end{array}$$

$$\text{(3)} \quad 33.66431 \div 1.01 = 33.331$$

$$\begin{array}{r} \text{(2)} \\ 1.505 \overline{) 12.82561} \end{array} \begin{array}{l} (8.522 \text{ Ans.}) \\ 12 \ 040 \cdot \cdot \end{array}$$

$$\begin{array}{r} 7856 \\ 7525 \\ \hline 3311 \\ 3010 \\ \hline \end{array}$$

$$\text{(4)} \quad .010001 \div .01 = 1.0001$$

$$\begin{array}{r} 3010 \\ 3010 \\ \hline \end{array}$$

$$\text{(5)} \quad 24.8410 \div .002 = 12420.5 \text{ Ans.}$$

$$\text{(6)} \quad .0125 \div 2.5 = .005 \text{ Ans.}$$

$$\text{(7)} \quad .051 \div .012 = 4.25 \text{ Ans.}$$

$$\text{(8)} \quad .063 \div 9 = .007 \text{ Ans.}$$

$$\text{(9)} \quad 1.05 \div 14 = .075 \text{ Ans.}$$

$$\text{(10)} \quad 5.1435 \div 4.05 = 1.27. \text{ Ans.}$$

$$\text{(11)} \quad .46575 \div 31.05 = .015 \text{ Ans}$$

$$\text{(12)} \quad 2.46616 \div .145 = 17.008 \text{ Ans.}$$

$$\begin{array}{r} \text{(13)} \\ 75.15204 \div 3 = 25.05068 \\ \div .3 = 250.5068 \\ \div .03 = 2505.068 \\ \div .003 = 25050.68 \\ \div .0003 = 250506.8 \end{array}$$

$$\begin{array}{r} \text{(14)} \\ 389.27688 \div 8 = 48.65961 \\ \div .08 = 4865.961 \\ \div .008 = 48659.61 \\ \div .0008 = 486596.1 \\ \div .00008 = 4865961. \end{array}$$



( 15 )

$$\begin{aligned}
 874.598 + 9 &= 41.622 \\
 + .9 &= 416.22 \\
 + .09 &= 4162.2 \\
 + .009 &= 41622 \\
 + .0009 &= 416220 \\
 + .00009 &= 4162200
 \end{aligned}$$

( 16 )

$$\begin{aligned}
 1528.4086488 + 6 &= 254.7847748 \\
 + .06 &= 25473.47748 \\
 + .006 &= 254734.7748 \\
 + .0006 &= 2547347.748 \\
 + .00006 &= 25473477.48 \\
 + .000006 &= 254734774.8
 \end{aligned}$$

( 17 )

$$125.7)17.543275(.1395646 + A. \quad .7493)1437.5435(1918.515 +$$

( 18 )

( 19 )

$$.0374).000177089(.004735 A. \quad 9.60)1674.35520(174.412 A.$$

( 20 )

( 21 )

$$1728)120463.2000(69.7125 A. \quad 34.75)47.54936(1.36832 + A.$$

( 22 )

( 23 )

$$.00573)74.35716(12976.816 + \quad 75.714).37545987(.004958 +$$

( 24 )

( 25 )

$$154.125 \div 25 = 6.165 \text{ cu. yd. } A. \quad \$167.875 \div 17 = \$9.875 A.$$

( 26 )

( 27 )

$$\$97.223 \div 45.22 = \$2.15 A. \quad \$232.655 \div 375.25 = \$0.62 A$$

( 28 )

( 29 )

$$\$2.25 \div .125 = 18 \text{ lb. } Ans.$$

( 30 )

$$34 \div 4.25 = 8 \text{ suits. } Ans.$$

( 31 )

$$366.52 \div 26.18 = 14 \text{ days. } Ans.$$

( 32 )

$$\begin{aligned}
 \$2.225 + \$0.985 + \$1.168 &= \$4.378 ; \\
 242.979 \div 4.378 &= 55.5 \text{ bushels. } Ans.
 \end{aligned}$$

( 33 )

$$46.347 \times 56 = \$2595.432, \text{ cost of wood-land ;}$$

$$59.465 \times 176 = \$10465.840, \text{ cost of meadow-land ;}$$

$$13.836 \times 37 = \underline{\$511.932}, \text{ cost of swamp-land ;}$$

$$\text{Area} = 269 \quad \$13573.204, \text{ entire cost ;}$$

$$13573.204 \div 269 = \$50.458 + \text{ average price per acre.}$$

( 34 )

$$4379.837 \times 6 = \$26279.022 ; \quad 8345 + 26279.022 = \$34624.022, \\ \text{value of whole property ; } \$3976.48 + 120 = \$4096.48, \text{ amount} \\ \text{of debts ; } 34624.022 - 4096.48 = \$30527.542 ; \quad 30527.542 \div \\ 4 = \$7631.8855, \text{ the eldest son's share ; } 30527.542 - \\ 7631.8855 = \$22895.6565 ; \quad \$22895.6565 \div 4 = \$5723.914125, \\ \text{each of the other sons' shares.}$$

( 2 )

( 3 )

$$.100001)1097.010970(10970 \quad .1629735)9811.0047600(60200$$

( 4 )

( 5 )

$$.0001).1000(1000 \text{ Ans.}$$

$$.1)10.0(100 \text{ Ans.}$$

( 6 )

$$.6)6.0(10 ; \quad .06)6.00(100 ; \quad .006)6.000(1000 ; \quad .2)6.0(30 ; \\ .3)6.0(20 ; \quad .003)6.000(2000 ; \quad .5)6.0(12 ; \quad .005)6.000(1200 ; \\ .000012)6.000000(500000$$

( 3 )

( 4 )

$$4.5)37.4000(8.311 + \text{ Ans.}$$

$$375)586.400(1.563 + \text{ Ans.}$$

( 5 )

$$81.032)94.0369000(1.16049 + \text{ Ans.}$$

( 6 )

$$2.25)36.26780(16.11902 + \text{ Ans.}$$

## CONTRACTIONS IN DIVISION.

(1)

$$\begin{aligned} 8169.274 \div 100 &= 81.69274 \\ \div 1000 &= 8.169274 \end{aligned}$$

(2)

$$\begin{aligned} 57135.62 \div 1000 &= 57.13562 \\ \div 100 &= 5.713562 \\ \div 10 &= 5713.562 \end{aligned}$$

(3)

$$\begin{aligned} 67.5 \div 100 &= .675 \\ \div 1000 &= .0675 \\ \div 1000000 &= .0000675 \end{aligned}$$

(4)

$$\begin{aligned} 4.9 \div 100 &= .049 \\ \div 1000 &= .0049 \\ \div 10000 &= .00049 \end{aligned}$$

(5)

$$\begin{aligned} .30467 \div 10 &= .030467 \\ \div 100 &= .0030467 \\ \div 1000 &= .00030467 \end{aligned}$$

(6)

$$\begin{aligned} .4741 \div 100 &= .004741 \\ \div 1000 &= .0004741 \\ \div 10000 &= .00004741 \end{aligned}$$

(7)

$$\begin{aligned} 4.97 \div 10 &= .497 \\ \div 100 &= .0497 \\ \div 1000 &= .00497 \end{aligned}$$

(1)

$$.74571345) 59.000000 (79.1188 \text{ A.}$$

52 19994

680006

671142

8864

7457

1407

746

661

596

65

59

6

(2)

$$495.783269) 17493.407704962 (35.2843$$

14873 50

261990

247892

14098

9916

4182

3966

216

198

18

15

3

(3)

8.47656180)98.1874370(11.5834036

84 7656180

134218190

84765618

49452572

42382809

7069763

6781249

288514

254297

34217

33906

311

254

57

51

6

(4)

14.734950)47194.379457(3202.8870

44204.850

2989529

2946990

42539

29470

13069

11788

1281

1178

103

103

## REDUCTION.

(1)

1 = .25 ; 1 = .5 ; 3 = .75.

4)1.00

.25

2)1.0

.5

4)3.00

.75

4 = .8 ; 7 = .875 ; 5 = .3125.

5)4.0

.8

8)7.000

.875

16)5.0000

.3125

(2)

(3)

3 = .375 ; 1 = .04.

8)3.000

.375

25)1.00

.04

(4)

3 = .015625 ; 4 = .266666 $\frac{2}{3}$  +192)3.000000

• .015625

15)4.00000.266666 $\frac{2}{3}$  +

(5)

1 = .125 ; 3 = .003.

8)1.000

.125

1000)3.000

.003

(6)

9 = .25714 + ; 15 = .44117 +

35)9.00000

.25714 +

34)15.00000

.44117 +

$$\begin{array}{r} (7) \\ 1412 = .23903 + \\ \underline{5907)1412.00000} \\ .23903 + \end{array}$$

$$\begin{array}{r} (8) \\ 275 = .07157 + \\ \underline{3842)275.00000} \\ .07157 + \end{array}$$

$$\begin{array}{r} (9) \\ 7 = .4375 ; 5 = .078125. \\ \underline{16)7.0000} \quad \underline{64)5.000000} \\ .4375 \quad .078125 \end{array}$$

$$\begin{array}{r} (10) \\ 14 = .00448. \\ \underline{3125)14.00000} \\ .00448 \end{array}$$

$$\begin{array}{r} (11) \\ 67 = .536 ; 93 = .372. \\ \underline{125)67.000} \quad \underline{250)93.000} \\ .536 \quad .372 \end{array}$$

$$\begin{array}{r} (12) \\ \frac{3}{8} \text{ of } \frac{2}{5} \text{ of } \frac{6}{1} = \frac{9}{10} = .9 \end{array}$$

$$\begin{array}{r} (13) \\ \frac{4}{5} \text{ of } \frac{11}{12} = \frac{11}{15} = .7333\frac{1}{3}. \\ \underline{3)11.0000} \\ .7333\frac{1}{3} \end{array}$$

$$\begin{array}{r} (14) \\ \frac{9}{16} \text{ of } \frac{43}{50} = \frac{387}{400} = .48375. \\ \underline{400)387.00000} \\ .48375 \end{array}$$

$$\begin{array}{r} (15) \\ \frac{2}{3} \text{ of } \frac{2\frac{1}{2}}{3\frac{1}{4}} = \frac{20}{39} = .51282 + \\ \underline{39)20.00000} \\ .51282 + \end{array}$$

$$\begin{array}{r} (16) \\ \frac{10\frac{1}{2}}{20} = \frac{43}{80} = .5375 ; \frac{4\frac{1}{4}}{758} = \frac{17}{3032} = .005606 + \\ \underline{80)43.0000} \\ .5375 \end{array}$$

$$\begin{array}{r} (17) \\ \frac{2}{3} \text{ of } \frac{3}{8} \times \frac{5}{12} = \frac{1}{6} = .16666\frac{2}{3}. \\ \underline{6)1.00000} \\ .16666\frac{2}{3} \end{array}$$

(18)

$$\frac{1}{2} \text{ of } \frac{2}{3} \text{ of } \frac{7}{8} \div \frac{3}{4} \text{ of } \frac{2}{4} = \frac{7}{24} \times \frac{16}{3} = \frac{14}{9} = 1.5555\frac{5}{9}$$

(19)

$$\frac{4}{22} \text{ of } \frac{7}{8} = \frac{7}{44} = .15909\frac{4}{11}$$

(20)

$$\frac{9}{20} \text{ of } \frac{7}{1} \times \frac{11}{30} \text{ of } \frac{8}{44} = \frac{504}{5} = \$100.80$$

(21)

$$\frac{3}{8} + 7\frac{1}{2} + 8\frac{3}{4} = 16\frac{1}{2} = \$17.85 \text{ Ans.}$$

(22)

$$\frac{4}{4} \text{ of } 18 + \frac{8}{11} \text{ of } \frac{1}{12} + 7\frac{4}{9} = \frac{1102}{36} = 30.6111\frac{1}{9} \text{ Ans.}$$

(23)

$$\frac{3}{8} \text{ of } 8\frac{3}{4} - \frac{3}{8} \text{ of } 3\frac{1}{2} = 2\frac{1}{2} = 2.9166\frac{2}{3} \text{ Ans.}$$

(24)

$$\frac{16}{11} + \frac{13}{7} + \frac{2}{9} = \frac{179}{63} = 2.8412 + \text{ Ans.}$$

(1)

$$.25 = \frac{25}{100} = \frac{1}{4}; .75 = \frac{75}{100} = \frac{3}{4}$$

(2)

$$.125 = \frac{125}{1000} = \frac{1}{8}; .625 = \frac{625}{1000} = \frac{5}{8}$$

(3)

$$.105 = \frac{105}{1000} = \frac{21}{200}; .0025 = \frac{25}{10000} = \frac{1}{400} \text{ Ans.}$$

(4)

$$.8015 = \frac{8015}{10000} = \frac{1603}{2000}; \quad 6042 = \frac{6042}{10000} = \frac{3021}{5000} \text{ Ans.}$$

(5)

$$.68375 = \frac{68375}{100000} = \frac{547}{800} \text{ Ans.}$$

(6)

$$.01875 = \frac{1875}{100000} = \frac{3}{160} \text{ Ans.}$$

(7)

$$.22575 = \frac{22575}{100000} = \frac{903}{4000} \text{ Ans.}$$

(8)

$$.265625 = \frac{265625}{1000000} = \frac{17}{64} \text{ Ans.}$$

(9)

$$.333\frac{1}{3} = \frac{333\frac{1}{3}}{1000} = \frac{1000}{3000} = \frac{1}{3}$$

(10)

$$.5714\frac{2}{7} = \frac{5714\frac{2}{7}}{10000} = \frac{40000}{70000} = \frac{4}{7}$$

(1)

$$14 \text{ dr.} \div 16 = 875 \text{ oz.}; \quad .875 = 16 = .0546875 \text{ lb. Ans.}$$

(2)

$$78 \text{ d.} \div 12 = 6.5 \text{ s.}; \quad 6.5 \div 20 = \text{£} .325 \text{ Ans.}$$

(3)

$$63 \text{ pt.} \div 2 = 31.5 \text{ qt}; \quad 31.5 \div 8 = 3.9375 \text{ pk. Ans.}$$

(4)

$$9 \text{ hr.} \div 24 = .375 \text{ da. Ans.}$$

(5)

$$375678 \text{ ft.} \div 16\frac{1}{2} \div 22768.363 \text{ rd.} +; \quad 22768.363 \div 320 = 71.1511 \text{ mi.} + \text{ Ans.}$$

(6)

$$19 \text{ pwt.} \div 20 = .95 \text{ oz.}; \quad .95 \div 12 = .6625 \text{ lb. Ans.}$$

(7)

$$8 \text{ oz.} \div 16 = .5 \text{ lb.}; \quad .5 \div 25 = .3 \text{ qr.}; \quad .3 \div 4 = .075 \text{ cwt.}; \quad 3.075 \div 20 = .15375 \text{ T. Ans.}$$

(8)

$$2.45s. \div 20 = \pounds.1225 \text{ Ans.}$$

(9)

$$1.047 R. \div 4 = .26175 A. \text{ Ans.}$$

(10)

$$176.9 \text{ yd.} \div 5\frac{1}{2} = 32.16363 + \text{rd. ; } 32.16363 \div 40 = .80409 \text{ fur. ;}$$

$$.80409 \div 8 = .100511 \text{ mi. Ans.}$$

(11)

$$14 \text{ lb.} \div 25 = .56 \text{ qr. ; } 2.56 \div 4 = .64 \text{ cwt. Ans.}$$

(12)

$$16 \text{ gr.} \div 24 = .66666 + \text{pwt. ; } 18.66666 \div 20 = .933333 + \text{oz. ;}$$

$$10.933333 \div 12 = .9111111 \text{ lb.} + \text{Ans.}$$

(13)

$$2 \text{ na.} \div 4 = .5 \text{ qr. ; } 3.5 \div 4 = .875 \text{ yd. Ans.}$$

(14)

$$1 \text{ gal.} \div 63 = .01587 + \text{hhd. Ans.}$$

(15)

$$43 \text{ sec.} \div 60 = .716666 + \text{min. ; } 6.716666 \div 60 = .1119444 \text{ hr. ;}$$

$$17.1119444 \div 24 = .7129976 + \text{da. Ans.}$$

(16)

$$\frac{3}{8} = .6 ; 2.6 \text{ qr.} \div 4 = .65 \text{ cwt. ; } 4.65 \div 20 = .2325 \text{ T. Ans.}$$

(17)

$$2 \text{ far.} \div 4 = 5d. ; 5.5 \div 12 = .45833s. ; 19.45833 \div 20 =$$

$$\pounds.97291 + \text{Ans.}$$

(18)

$$37 \text{ P.} \div 40 = .925 \text{ R. ; } 1.925 \div 4 = .48125 \text{ A. Ans.}$$



( 19 )

$$3 \text{ na.} \div 4 = .75 \text{ qr.} ; 2.75 \div 5 = .55 \text{ E. E. } \textit{Ans.}$$

( 20 )

$$\begin{aligned} 6.5 \text{ in.} \div 12 &= .541666 + \text{ft.} ; 2.541666 \div 3 = .847222 \text{ yd.} ; \\ 2.847222 \text{ yd.} \div 5\frac{1}{2} &= .5176767 + \text{rd.} ; 5176767 \div 40 = \\ .0129419 \text{ fur.} ; .0129419 \div 8 &= .0016177 \text{ mi.} + \end{aligned}$$

( 21 )

$$22.5'' \div 60 = .375' ; 15.375' \div 60 = .25625^\circ \textit{ Ans.}$$

( 22 )

$$1 \text{ lb.} \div 25 = .04 ; 1.04 \text{ qr.} \div 4 = .26 ; 1.26 \text{ cwt.} \div 20 = .063 \text{ T. } \textit{A.}$$

( 23 )

$$3 \text{ pk.} \div 4 = .75 \text{ bu.} ; 3.75 \div 36 = .10416 \text{ chal. } \textit{Ans.}$$

( 24 )

$$\begin{aligned} 6 \text{ in.} \div 12 &= .5 \text{ ft.} ; 1.5 \div 3 = .5 \text{ yd.} ; 17.5 \div 5\frac{1}{2} = 3.181818 \text{ rd.} ; \\ 3.181818 \div 40 &= .07954545 \text{ fur.} ; .07954545 \div 8 = .00994318 \text{ mi.} \end{aligned}$$

( 25 )

$$9.5 \text{ mo.} \div 12 = .791666 + \text{yr. } \textit{Ans.}$$

( 26 )

$$14 \text{ P} \div 40 = .35 \text{ R.} ; 1.35 \text{ R} \div 4 = .3375 \text{ A. } \textit{Ans.}$$

( 27 )

$$45 \text{ pk.} \div 4 = 11.25 \text{ bu.} ; 11.25 \div 36 = .3125 \text{ chal. } \textit{Ans.}$$

( 28 )

$$\begin{aligned} 72 \text{ yd.} \div 5\frac{1}{2} &= 13.090 \text{ rd.} ; 13.0909 \div 40 = .32727 \text{ fur.} ; \\ .32727 \div 8 &= .0409 + \text{mi. } \textit{Ans.} \end{aligned}$$

(29)

$$9 \div 24 = .375 ; .375 \div 20 = .01875 \text{ ream. } Ans.$$

(30)

$$4.0125 \text{ in.} \div 12 = .334375 \text{ ft.} ; .334375 \div 16\frac{1}{2} = .020265 + \text{rd.}$$

(31)

$$10 \text{ wk.} + 2 \text{ da.} = 72 \text{ da.} ; 72 \div 366 = .19672 + \text{yr. } Ans.$$

(32)

$$10 \text{ gr.} \div 20 = .5 \text{ } \textcircled{D} ; 1.5 \div 3 = .5 \text{ } \textcircled{3} ; 1.5 \div 8 = .1875 \text{ } \frac{3}{4} ; \\ 4.1875 \div 12 = .3489\overline{15} \text{ } Ans.$$

(33)

$$1.75 \text{ pt.} \div 2 = .875 \text{ qt.} ; 3.875 \div 4 = .96875 \text{ gal.} ; \\ .96875 \div 63 = .01537 + \text{hhd. } Ans.$$

(34)

$$1.8 \text{ sq. ft.} \div 9 = .2 \text{ sq. yd.} ; 24.2 \div 30\frac{1}{4} = .8 \text{ P.} ; 8 \div 40 = .02 \text{ R.} ; \\ .02 \div 4 = .005 \text{ A. } Ans.$$

(1)

$$.6725 \text{ cwt.} \times 4 = 2.69 \text{ qr.} ; .69 \times 25 = 17.25 \text{ lb.} ; 25 \times 16 = 4. \text{ oz.} ; \\ 2 \text{ qr. } 17 \text{ lb. } 4 \text{ oz. } Ans.$$

(2)

$$31 \text{ pi.} \times 2 = 1.22 \text{ hhd.} ; .22 \times 63 = 13.86 \text{ gal.} ; 86 \times 4 = 3.44 \text{ qt.} ; \\ 1 \text{ hhd. } 13 \text{ gal. } 3.44 \text{ qt. } Ans.$$

(3)

$$£.83229 \times 20 = 16.64580 ; .64580 \times 12 = 7.7496 \text{d.} ; \\ .7496 \times 4 = 2.99 + \text{far.} ; 16 \text{s. } 7 \text{d. } 2.99 \text{ far. } Ans.$$

(4)

$$.0625 \text{ bbl.} \times 36 = 2.25 \text{ gal.} ; .25 \times 4 = 1 \text{ qt.} ; 2 \text{ gal. } 1 \text{ qt. } Ans.$$

(5)

.42857 mo.  $\times 4 = 1.71428$  wk. ;  $.71428 \times 7 = 4.99996$  da. ;  
 .99996  $\times 24 = 23.9904$  hr. ;  $.99904 \times 60 = 59.9424$  min. ;  
 .9424  $\times 60 = 56.5 +$  sec. ; 1 wk. 4 da. 23 hr. 59 min. 56.5 sec. *A.*

(6)

.05 A.  $\times 4 = .20$  R. ;  $.20 \times 40 = 8$  P. *Ans.*

(7)

.3375 T.  $\times 20 = 6.75$  cwt. ;  $.75 \times 4 = 3$  qr. ; 6 cwt. 3 qr. *Ans.*

(8)

.87 pi.  $\times 2 = 1.75$  hhd. ;  $.75 \times 63 = 47.25$  gal. ;  $.25 \times 4 = 1$  qt. ;  
 1 hhd. 47 gal. 1 qt. *Ans.*

(9)

.375 hhd.  $\times 54 = 20.25$  gal. ;  $.25 \times 4 = 1$  qt. ; 20 gal. 1 qt. *Ans.*

(10)

.911111 lb.  $\times 12 = 10.933332$  oz. ;  $.933332 \times 20 = 18.66664$  pwt. ;  
 .66664  $\times 24 = 15.99 +$  gr. ; 10 oz. 18 pwt. 15.99 gr. *Ans.*

(11)

.675 E. E.  $\times 5 = 3.375$  qr. ;  $.375 \times 4 = 1.5$  na. ; 3 qr. 1.5 na. *A.*

(12)

.001136  $\times 8 \times 40 \times 16\frac{1}{2} = 5.99808$  ft. ;  
 .99808  $\times 12 = 11.9 +$  in. = 5 ft. 11.9 + in. *Ans.*

(13)

000242 sq. mi.  $\times 640 \times 4 \times 40 = 24.7808$  P. ;  $.7808$  P.  $\times 30\frac{1}{4} =$   
 23.6192 sq. yd. ;  $.6192$  sq. yd.  $\times 9 = 5.5728$  sq. ft. ;  
 .5728 sq. ft.  $\times 144 = 82.4832$  sq. in. ;  
 24 P. 23 sq. yd. 5 sq. ft. 82.4832 sq. in. *Ans.*

(14)

$$\begin{aligned}
 .4629 \text{ deg.} \times 69\frac{1}{2} &= 32.17155 \text{ mi.}; .17155 \text{ mi.} \times 8 = 1.3724 \text{ fur.}; \\
 .3724 \text{ fur.} \times 40 &= 14.896 \text{ rd.}; .896 \text{ rd.} \times 16\frac{1}{2} = 14.784 \text{ ft.}; \\
 .784 \text{ ft.} \times 12 &= 9.408 \text{ in.}; 32 \text{ mi. } 1 \text{ fur. } 14 \text{ rd. } 14 \text{ ft. } 9.408 \text{ in.}
 \end{aligned}$$

(15)

$$.875 \text{ yd.} \times 3 = 2.625 \text{ ft.}; .625 \times 12 = 7.5 \text{ in.}; 2 \text{ ft. } 7.5 \text{ in. } \textit{Ans.}$$

(16)

$$\begin{aligned}
 .3489 \text{ lb} \times 12 &= 4.1868 \frac{2}{3}; .1868 \times 8 = 1.4944 \frac{2}{3}; .4944 \times 3 = \\
 1.4832 \text{ D}; .4832 \times 20 &= 9.6 + \text{gr.}; 4 \frac{2}{3} \text{ } 1 \frac{2}{3} \text{ } 1 \text{ D } 9.6 \text{ gr.}
 \end{aligned}$$

(17)

$$\begin{aligned}
 .759 \text{ A.} \times 4 &= 3.036 \text{ R.}; .036 \times 40 = 1.44 \text{ P.}; .44 \times 30\frac{1}{4} = \\
 13.31 \text{ sq. yd.}; 3 \text{ R. } 1 \text{ P. } 13.31 \text{ sq. yd. } \textit{Ans.}
 \end{aligned}$$

(18)

$$.01875 \times 20 = .375 \text{ quires}; .375 \times 24 = 9 \text{ sheets. } \textit{Ans.}$$

(19)

$$.0055 \text{ T.} \times 20 = .11 \text{ cwt.}; .11 \times 4 = .44 \text{ qr.}; .44 \times 25 = 11 \text{ lb. } \textit{A.}$$

(20)

$$.625 \text{ s.} \times 12 = 7.5 \text{ d.}; .5 \times 4 = 2. \text{ far.}; 7 \text{ d. } 2 \text{ far. } \textit{Ans.}$$

(21)

$$.3375 \text{ A.} \times 4 = 1.35 \text{ R.}; .35 \times 40 = 14 \text{ P.}; 1 \text{ R. } 14 \text{ P. } \textit{Ans.}$$

(22)

$$\begin{aligned}
 .785 \text{ yr.} \times 365\frac{1}{4} &= 286.72125 \text{ da.}; .72125 \times 24 = 17.31 \text{ hr.}; \\
 .31 \times 60 &= 18 \text{ min. } 36 \text{ sec.}; 286 \text{ da. } 17 \text{ hr. } 18 \text{ min. } 36 \text{ sec. } \textit{A.}
 \end{aligned}$$

## REPEATING DECIMALS.

$$\begin{array}{lll} (1) & (2) & (3) \\ \frac{2}{150} = .06 \text{ A.} & \frac{13}{80} = .08125 \text{ A.} & \frac{11}{320} = .034375 \text{ A.} \end{array}$$

$$\begin{array}{lll} (4) & (5) & (6) \\ \frac{17}{1280} = .01328125 \text{ A.} & \frac{11}{640} = .0171875 \text{ A.} & \frac{17}{300} = .034 \text{ A.} \end{array}$$

$$\begin{array}{ll} (7) & (8) \\ \frac{7}{250} = .028 \text{ Ans.} & \frac{31}{1280} = .02421875 \text{ Ans.} \end{array}$$

$$\begin{array}{ll} (1) & (2) \\ \frac{5}{7} = .714285\frac{5}{7} \text{ Ans.} & \frac{4}{15} = .26666\frac{2}{3} \text{ Ans.} \end{array}$$

$$\begin{array}{ll} (3) & (4) \\ \frac{5}{11} = .454545\frac{5}{11} \text{ Ans.} & \frac{7}{18} = .38888\frac{1}{3} = .38888\frac{2}{3} \text{ Ans.} \end{array}$$

## REDUCTION OF REPETENDS TO COMMON FRACTIONS.

$$\begin{array}{l} (3) \\ .6' = \frac{6}{9} = \frac{2}{3}; \quad .162' = \frac{162}{999} = \frac{6}{37}; \quad .769230' = \frac{769230}{999999} = \frac{19}{25}; \\ .945' = \frac{945}{999} = \frac{105}{111} = \frac{35}{37}; \quad .09' = \frac{9}{99} = \frac{1}{11} \end{array}$$

$$\begin{array}{l} (4) \\ .594405' = \frac{594405}{999999} = \frac{85}{143}; \quad .36' = \frac{36}{99} = \frac{4}{11}; \\ .142857' = \frac{142857}{999999} = \frac{1}{7} \end{array}$$

$$\begin{array}{l} (4) \\ 13'8' = \frac{13}{100} + \frac{8}{900} = \frac{125}{900} = \frac{5}{36}; \quad 75'43' = 7 + \frac{5}{10} + \frac{43}{990} = 7\frac{538}{990} = \\ 7\frac{269}{495}; \quad .04'354' = \frac{4}{100} + \frac{354}{99990} = \frac{4350}{999900} = \frac{29}{6666}; \quad 37.5'4' = 37 + \\ \frac{5}{10} + \frac{4}{90} = 37\frac{49}{90}; \quad .6'75' = \frac{6}{10} + \frac{75}{990} = \frac{669}{990} = \frac{223}{330}; \quad .7'54347' = \\ \frac{7}{10} + \frac{54347}{999990} = \frac{754347}{9999910} \end{array}$$

(5)

$$\begin{aligned}
 .7'5' &= \frac{7}{10} + \frac{5}{90} = \frac{68}{90} = \frac{34}{45}; & .4'38' &= \frac{4}{10} + \frac{38}{990} = \frac{434}{990} = \frac{217}{495}; \\
 .09'3' &= \frac{9}{100} + \frac{3}{900} = \frac{84}{900} = \frac{7}{75}; & 4.7'543' &= 4 + \frac{7}{10} + \frac{543}{9990} = \\
 .41\frac{256}{1665}; & .009'87' &= 4\frac{7536}{9990} &= \frac{9}{1000} + \frac{87}{99000} = \frac{978}{99000} = \frac{163}{16500}; \\
 .4'5' &= \frac{4}{10} + \frac{5}{90} = \frac{41}{90}
 \end{aligned}$$

(2)

$$\frac{210}{1120} = .1875 \quad \text{it has no repetend but 0.}$$

(3)

$$\frac{4}{1160} = .0'0344827586206896551724137931'$$

(4)

$$\frac{12}{125} = .09756'; \quad \frac{80}{135} = .592'; \quad \frac{72}{135} = .53'$$

(2)

$$\begin{aligned}
 2.4'181818' \\
 .5'925925' \\
 .008'497133'
 \end{aligned}$$

(3)

$$\begin{aligned}
 165.16'416416' \\
 .04'040404' \\
 .03'777777'
 \end{aligned}$$

(4)

$$\begin{aligned}
 .5'333333' \\
 .4'757575' \\
 1.7'577577'
 \end{aligned}$$

ADDITION.

(2)

$$\begin{array}{r}
 67.3'454545' \quad 4 \\
 9.6'516516' \quad 5 \\
 .2'525252' \quad 5 \\
 17.4'777777' \quad 7 \\
 .5'555555' \quad 5 \\
 \hline
 95.2'829647' \quad (2)26
 \end{array}$$

(3)

$$\begin{array}{r}
 .47'547547' \quad 5 \\
 3.75'434434' \quad 4 \\
 64.75'757575' \quad 7 \\
 .57'575757' \quad 5 \\
 .17'887887' \quad 8 \\
 \hline
 69.74'203112' \quad (3)29
 \end{array}$$

(4)

$$\begin{array}{r}
 .5'555555555555' \quad 5 \\
 4.3'777777777777' \quad 7 \\
 49.4'575757575757' \quad 5 \\
 .4'954954954954' \quad 9 \\
 .7'345734573457' \quad 3 \\
 \hline
 55.6'209780437503' \quad 29
 \end{array}$$

(5)

$$\begin{array}{r}
 .1'751751' \quad 7 \\
 42.5'757575' \quad 7 \\
 .3'753753' \quad 7 \\
 .4'954954' \quad 9 \\
 3.7'545454' \quad 5 \\
 \hline
 47.3'763490' \quad 35
 \end{array}$$

(6)

$$\begin{array}{r}
 165.0'000000' \\
 .1'641641' \quad 6 \\
 147.0'404040' \quad 4 \\
 .4'9595959' \quad 5 \\
 94.3'777777' \quad 7 \\
 .4'7123457' \quad 1 \\
 \hline
 416.2'542876' \quad 28
 \end{array}$$

## SUBTRACTION.

$$\begin{array}{r} (2) \\ 47.5'333' \quad 3 \\ 1.7'577' \quad 5 \\ \hline 45.7'755' \end{array}$$

$$\begin{array}{r} (3) \\ 17.5'735' \quad 73 \\ 14.5'777' \quad 77 \\ \hline 2.9'957' \end{array}$$

$$\begin{array}{r} (4) \\ 17.43'3' \\ 12.34'3' \\ \hline 5.09'0' \end{array}$$

$$\begin{array}{r} (5) \\ 1.12'754754754754' \quad 7 \\ .47'384738473847' \quad 3 \\ \hline .65'370016280907' \end{array}$$

$$\begin{array}{r} (6) \\ 4.75'0' \quad 0 \\ .37'5' \quad 5 \\ \hline 4.37'4' \end{array}$$

$$\begin{array}{r} (7) \\ 4.794'000' \quad 0 \\ .174'474' \quad 4 \\ \hline 4.619'525' \end{array}$$

$$\begin{array}{r} (8) \\ 1.4577'7' \\ .3654'0' \\ \hline 1.0923'7' \end{array}$$

$$\begin{array}{r} (9) \\ 1.4937'937' \\ .1475'000' \\ \hline 1.3462'937' \end{array}$$

## MULTIPLICATION.

$$\begin{array}{c} (2) \\ \begin{array}{l} 59 \\ .375'4' \times 14.75 = \frac{3379}{9000} \times \frac{1475}{100} = \frac{199361}{36000} = 5\frac{12361}{36000} = 5.53780'5' \end{array} \end{array}$$

$$\begin{array}{c} (3) \\ 4'253' \times 2.57 = \frac{4249}{9900} \times \frac{257}{100} = \frac{1091993}{990000} = 1\frac{92993}{990000} = 1.093'086' \end{array}$$

$$\begin{array}{c} (4) \\ .437 \times 3.7'5' = \frac{437}{1000} \times \frac{375}{100} = \frac{163875}{100000} = 1\frac{63875}{100000} = 1.6411'7' \text{ Ans.} \end{array}$$

$$\begin{array}{r}
 31 \quad (5) \\
 93 \\
 4.573 \times .375' = \frac{4573}{1000} \times \frac{372}{990} = \frac{141763}{82500} = 1\frac{12263}{82500} = 1.7183'39' \\
 \quad \quad \quad 250 \quad 330
 \end{array}$$

$$\begin{array}{r}
 (6) \\
 3.456' \times .425' = \frac{3411}{900} \times \frac{383}{990} = \frac{397171}{270000} = 1\frac{127171}{270000} = 1.4710'037'
 \end{array}$$

$$\begin{array}{r}
 (7) \\
 1.456' \times 4.23' = 1\frac{456}{999} \times 4\frac{21}{90} = \frac{12319}{1998} = 6\frac{331}{1998} = 6.1'656'
 \end{array}$$

$$\begin{array}{r}
 (8) \\
 45.1'3' \times .245' = 45\frac{12}{90} \times \frac{245}{999} = \frac{165865}{14985} = 11\frac{1030}{14985} = \\
 \quad \quad \quad 11.068735402' \text{ Ans.}
 \end{array}$$

$$\begin{array}{r}
 (9) \\
 14116 \quad 859 \\
 4.7053' \times 1.735' = \frac{47053}{90000} \times \frac{1718}{990} = \frac{12125644}{14850000} = .81654'168350' \\
 \quad \quad \quad 30000 \quad 495
 \end{array}$$

## DIVISION.

$$\begin{array}{r}
 (2) \\
 24.3'18' \div 1.792 = 24\frac{318}{990} \div 1\frac{792}{1000} = \frac{66875}{4928} = 13.570413'961038'
 \end{array}$$

$$\begin{array}{r}
 (3) \\
 8.5968 \div .2'45' = 8\frac{5968}{10000} \div \frac{243}{990} = \frac{4378}{125} = 35\frac{3}{125} = 35.024'0' \text{ A.}
 \end{array}$$

$$\begin{array}{r}
 (4) \\
 2.295 \div .297' = 2\frac{295}{1000} \div \frac{297}{999} = \frac{458541}{59400} = 7\frac{42741}{59400} = 7.719'54' \text{ A.}
 \end{array}$$

$$\begin{array}{r}
 (5) \\
 47.345 \div 1.76' = 47\frac{345}{1000} \div 1\frac{76}{99} = \frac{47345}{1000} \times \frac{99}{175} = \frac{937431}{35000} = \\
 \quad \quad \quad 26.7837'428571' \text{ Ans.}
 \end{array}$$

$$\begin{array}{r}
 (6) \\
 13.5'169533' \div 4.297' = 13\frac{5169528}{9999990} \times \frac{999}{4293} = \frac{135169398}{42972930} = \\
 \quad \quad \quad 3.1'45' \text{ Ans.}
 \end{array}$$



(7)

$$.45' \div .118881' = \frac{45}{99} \times \frac{999999}{118881} = \frac{16835}{4403} = 3.8235294117647058' \text{ Ans.}$$

(8)

$$.475' \div .3753' = \frac{475}{999} \div \frac{3753}{9990} = \frac{19}{5} = 1\frac{4}{5} = 1.2' \text{ Ans.}$$

(9)

$$.3753' \div .24' = \frac{3753}{999} \div \frac{24}{99} = \frac{6875}{444} = 15.48423' \text{ Ans.}$$

## CONTINUED FRACTIONS.

(2)

$$\frac{21}{39} = \frac{1}{1+1} = 1 \frac{1}{1+\frac{1}{6}} = \frac{1}{2}$$

(3)

$$\frac{47}{65} = \frac{1}{1+1} = 1 \frac{1}{2+1} = \frac{2}{3}$$

(4)

$$\frac{17}{27} = \frac{1}{1+1} = 1 \frac{1}{1+1} = \frac{2}{3}$$

(5)

$$\frac{67}{85} = \frac{1}{1+1} = 1 \frac{1}{3+1} = \frac{2}{5}$$

(6)

$$\frac{37}{87} = \frac{1}{2+1} = \frac{1}{2} \frac{1}{2+1} = \frac{2}{5}$$

(7)

5 hr. 48 min. 48 sec. = excess =

$$\frac{20928}{86400} \text{ da.} = \frac{109}{430} \text{ da.} = 1 \frac{1}{4+1} = \frac{5}{9}$$

$$(\frac{31}{128} + \frac{39}{161}) \div 2 = \frac{993}{41216} \text{ A.}$$

$$\frac{1}{1+1} = \frac{2}{3}$$

$$\frac{1}{3+1} = \frac{4}{7}$$

$$\frac{1}{1+\frac{1}{2}} = \frac{2}{3}$$

$$\begin{array}{lll} (2) & (3) & (4) \\ 6 : 24 \text{ is } \frac{24}{6} = 4 & 7 : 35 \text{ is } \frac{35}{7} = 5 & 15 : 6 \text{ is } \frac{6}{15} = \frac{2}{5} \end{array}$$

$$\begin{array}{ll} (5) & (6) \\ 5 \times 4 : 6 \times 10 \text{ is } \frac{60}{20} = 3 \text{ A.} & 6 \times 3 : 9 \times 4 \text{ is } \frac{36}{18} = 2 \end{array}$$

$$(7) \\ 4 \times 9 \times 3 : 5 \times 8 \times 5 \text{ is } \frac{5 \times 8 \times 5}{4 \times 9 \times 3} = \frac{50}{27} = 1\frac{23}{27} \text{ Ans.}$$

$$\begin{array}{lll} (8) & (9) & (10) \\ 6 : 4 \text{ is } \frac{4}{6} = \frac{2}{3} & 10 : 5 \text{ is } \frac{5}{10} = \frac{1}{2} & 34 : 17 \text{ is } \frac{17}{34} = \frac{1}{2} \end{array}$$

$$\begin{array}{lll} (11) & (12) & (13) \\ 450 : 300 \text{ is } \frac{300}{450} = \frac{2}{3} & 96 : 16 \text{ is } \frac{16}{96} = \frac{1}{6} & 12 : 8 \text{ is } \frac{8}{12} = \frac{2}{3} \end{array}$$

$$\begin{array}{lll} (14) & (15) & (16) \\ 48 : 16 \text{ is } \frac{16}{48} = \frac{1}{3} & 90 : 18 \text{ is } \frac{18}{90} = \frac{1}{5} & 165 : 15 \text{ is } \frac{15}{165} = \frac{1}{11} \end{array}$$

$$\begin{array}{lll} (17) & (1) & (2) \\ 11 : 9 \text{ is } \frac{9}{11} \text{ A.} & 16 \times 7 = 112 \text{ A.} & 30 \div 6 = 5 \text{ A.} \end{array}$$

$$\begin{array}{lll} (3) & (4) & (5) \\ 15 \times 4 = 60 \text{ Ans.} & 7 \div 1\frac{2}{3} = 5 \text{ Ans.} & \frac{4}{5} \times \frac{7}{8} = \frac{7}{10} \text{ A.} \end{array}$$

$$\begin{array}{lll} (6) & (7) & (8) \\ 256 \div 8 = \$32 & 14 \times 5 \times 10 \div 25 = 28 & 143 \div 2\frac{1}{2} = \$65 \end{array}$$

$$(1) \\ 5 : 30 :: 10 : x = \frac{30 \times 10}{5} = 60 \text{ Ans.}$$

$$(2) \\ 9 : x :: 12 : 36 ; x = \frac{36 \times 9}{12} = 27 \text{ Ans.}$$

(3)

$$15 : 45 :: x : 27; \frac{15 \times 27}{45} = 9 \text{ Ans.}$$

(4)

$$\frac{1}{5} : \frac{1}{20} :: x : \frac{1}{32}; x = \frac{1}{5} \times \frac{1}{32} \times \frac{20}{1} = \frac{1}{8} \text{ Ans.}$$

(5)

$$5 : 10 :: 9 : x = \frac{10 \times 9}{5} = 18 \text{ Ans.}$$

(6)

$$6 : 24 :: 14 : x = \frac{24 \times 14}{6} = 56 \text{ Ans.}$$

(7)

$$9 : 12 :: x : 16; x = \frac{16 \times 9}{12} = 12 \text{ Ans.}$$

(8)

$$16 : x :: 8 : 20; x = \frac{16 \times 20}{8} = 40 \text{ Ans.}$$

## SINGLE RULE OF THREE.

(1)

$$\begin{array}{ccccc} \text{bata.} & & \text{bata.} & & \$ \\ 8 & : & 110 & :: & 24 : x = \$330. \end{array}$$

$$\frac{110 \times 24}{8} = \$330 \text{ Ans.}$$

(2)

$$\begin{array}{ccccc} \text{bbl.} & & \text{bbl.} & & \$ \\ 2 & : & 12 & :: & 15 : x = \$90 \end{array}$$

$$\frac{12 \times 15}{2} = \$90 \text{ Ans.}$$

(3)

$$\begin{array}{cccc} \text{da.} & \text{da.} & \text{mi.} & \text{mi.} \\ 6 & : 18 & :: 168 & : x = 504 \end{array}$$

$$\begin{array}{r} 3 \\ 18 \times 168 \\ \hline 6 \end{array} = 504 \text{ mi. } \textit{Ans.}$$

(4)

$$\begin{array}{ccc} \text{lb.} & \text{lb.} & \$ \\ 8 & : 13 & :: 1.28 : x = \$2.08 \end{array}$$

$$\begin{array}{r} 1 \quad .16 \\ 13 \times 1.28 \\ \hline 8 \end{array} = 2.08 \text{ } \textit{Ans.}$$

(5)

$$\begin{array}{ccc} \text{bbl.} & \text{bbl.} & \$ \\ 300 & : 125 & :: 2100 : x = \$875 \end{array}$$

$$\begin{array}{r} 7 \\ 125 \times 2100 \\ \hline 300 \end{array} = \$875 \text{ } \textit{Ans.}$$

(6)

$$\begin{array}{ccc} \text{sh.} & \text{sh.} & \text{lb.} \\ 120 & : 36 & :: 330 : x = 99 \text{ lb.} \end{array}$$

$$\begin{array}{r} 3 \quad 33 \\ 36 \times 330 \\ \hline 120 \\ 10 \\ 1 \end{array} = 99 \text{ lb. } \textit{Ans.}$$

(7)

$$\begin{array}{ccc} \text{yd.} & \text{yd.} & \$ \\ 80 & : 650 & :: 340 : x = \$2762.50 \end{array}$$

$$\begin{array}{r} 325 \quad 17 \\ 650 \times 340 \\ \hline 80 \\ 2 \end{array} = \$2762.50 \text{ } \textit{Ans.}$$

(8)

$$\begin{array}{ccc} \text{lb.} & \text{lb.} & \$ \\ 1 & : 400 & :: .05 : x = \$20.00 \end{array}$$

$$400 \times .05 = \$20.00 \text{ } \textit{Ans.}$$

(9)

$$\begin{array}{ccc} \text{gal.} & \text{gal.} & \$ \\ 6 & : 6 \times 63 = 378 & :: 1.95 : x = \$122.85 \end{array}$$

$$\frac{378 \times 1.95}{6} = \$122.85 \text{ } \textit{Ans.}$$

(10)

$$\begin{array}{ccc} \text{men.} & \text{men.} & \text{lb.} \\ 16 & : 40 & :: 560 : x = 1400 \text{ lb.} \end{array}$$

$$\begin{array}{r} 5 \quad 280 \\ 40 \times 560 \\ \hline 16 \end{array} = 1400 \text{ lb. } \textit{Ans.}$$

(11)

$$\begin{array}{ccc} \text{da.} & & \text{da.} \quad \text{mi.} \\ 12 : 366 - 52 = 314 & :: & 630 : x = 16485 \text{ mi.} \end{array}$$

$$\begin{array}{r} 157 \quad 105 \\ 314 \times 630 \\ \hline 12 \\ 2 \end{array} = 16485 \text{ mi. } A.$$

(12).

$$\begin{array}{ccc} \text{yd.} & & \text{yd.} \quad \text{¢} \\ 2 : 25 \times 3 = 75 & :: & 3.25 : x = \$121.87\frac{1}{2} \end{array}$$

$$\frac{75 \times 3.25}{2} = \$121.87\frac{1}{2} \text{ Ans.}$$

(13)

$$\begin{array}{ccc} \text{yd.} & \text{yd.} & \text{a.} \\ 3 : 36 & :: & 18 : x = 216 = \$27 \end{array} \quad \begin{array}{r} 6 \\ 36 \times 18 \\ \hline 3 \end{array} = .216 \text{ s. ; } \frac{216}{8} = \$27$$

(14)

$$\begin{array}{ccc} \text{a.} & \text{d.} & \text{a.} \quad \text{d.} \quad \text{oz.} \\ 8 & 4 : 7 & 6 :: 8 : x = 7\frac{1}{5} \end{array} \quad \begin{array}{r} 18 \quad 2 \\ 90 \times 8 \\ \hline 100 \\ 25 \\ 5 \end{array} = \frac{36}{5} = 7\frac{1}{5} \text{ oz}$$

(15)

$$5 \text{ A. } 1 \text{ R. } 16 \text{ P. } : 125 \text{ A. } 2 \text{ R. } 20 \text{ P. } :: \$150.5 : x$$

$$\begin{array}{r} 4 \\ 21 \\ 40 \\ \hline 856 \end{array} \quad \begin{array}{r} 4 \\ 502 \\ 40 \\ \hline 20100 \end{array}$$

$$\begin{array}{r} 5025 \quad 75.25 \\ 20100 \times 150.50 \\ \hline 856 \\ 214 \\ 107 \end{array} = \$3533.936$$

(16)

$$\begin{array}{ccc} \text{cwt.} & \text{qr.} & \text{cwt.} \\ 13 & 2 : 9 & :: \$129.93 : x \\ 3 & 4 \\ \hline 54 & 36 \end{array}$$

$$\begin{array}{r} 2 \quad 43.31 \\ 36 \times 129.93 \\ \hline 54 \\ 3 \end{array} = \$86.62 \text{ A.}$$

(17)

$$\begin{array}{ccccccc} \text{men.} & & \text{men.} & & \text{£} & & \text{a.} \\ 750 & : & 10500 & :: & 2834 & 5 & : x \\ & & & & & 20 & \\ & & & & & \hline & & & & & 56685 \end{array}$$

$$\begin{array}{r} 11337 \quad 210 \\ 56685 \times 10500 \\ \hline 750 \times 20 \text{ s. } (= £1). \\ 15 \quad 4 \\ 2 \end{array} = \frac{79352}{2} = £39679\frac{1}{2} \text{ Ans.}$$

(18)

$$\begin{array}{ccc} \text{yd.} & \text{yd.} & \text{yd.} \\ \frac{5}{8} & : & \frac{3}{2} :: \frac{15}{4} : x = 9 \text{ yd.} \end{array} \quad \begin{array}{c} 3 \\ \frac{3}{2} \times \frac{15}{4} \times \frac{8}{5} = 9 \text{ yd. Ans.} \\ 1 \end{array}$$

(19)

$$\begin{array}{ccc} \text{rd.} & \text{rd.} & \text{rd.} \\ 7 & : & \frac{7}{2} :: \frac{84}{5} : x = 8\frac{2}{5} \text{ rd.} \end{array} \quad \begin{array}{c} 42 \\ \frac{7}{2} \times \frac{84}{5} \times \frac{1}{7} = \frac{42}{5} = 8\frac{2}{5} \text{ rd. A.} \end{array}$$

(20)

$$\begin{array}{ccc} \text{ft.} & \text{ft.} & \text{ft.} \\ \frac{3}{4} \times 3 = \frac{9}{4} & : & 30 :: 36 : x = 480 \end{array}$$

$$\frac{30}{1} \times \frac{36}{1} \times \frac{4}{9} = 480 \text{ ft.} = 160 \text{ yd.}$$

(21)

$$\begin{array}{ccc} \text{hr.} & \text{hr.} & \text{da.} \\ 10 & : & 9 :: 8 : x = 7\frac{1}{5} \end{array}$$

$$\frac{9 \times 8}{10} = \frac{36}{5} = 7\frac{1}{5} \text{ da. Ans.}$$

(22)

$$\begin{array}{ccc} \text{mo.} & \text{mo.} & \text{persons.} \\ 24 & : & 8 :: 15 : x \end{array} \quad \begin{array}{c} 5 \\ \frac{8 \times 15}{24} = 5 \text{ persons for 2 years.} \end{array}$$

15-5=10=number to be diminished. Ans.

(23)

$$\begin{array}{ccccccc} \text{yr.} & \text{mo.} & \text{mo.} & \text{mo.} & \text{men.} & \text{men.} & \\ 2 & 6=30 & : & 6 :: 4600 : x = 920 \end{array} \quad \begin{array}{c} 920 \\ \frac{4600 \times 6}{30} = 920 \text{ men. Ans.} \end{array}$$

(24)

$$\begin{array}{ccc} \text{men.} & \text{men.} & \text{da.} \\ 15000 : 9000 :: 90 : x = 54 \text{ da.} \end{array} \quad \frac{\overset{3}{9000} \times \overset{18}{90}}{\underset{\$}{15000}} = 54 \text{ da. } A.$$

(25)

$$\begin{array}{ccc} \text{yd.} & \text{qr.} & \text{yd.} & \text{qr.} \\ 3 & 2 : 8 & 3 & :: \$15.75 : x \end{array} \quad \frac{\overset{5}{35} \times \overset{15}{15.75}}{\underset{2}{14}} = \$39.375 \text{ Ans.}$$

$$\frac{4}{14} \quad \frac{4}{35}$$

(26)

$$\begin{array}{ccc} \text{h.} & \text{h.} & \\ .5 : .95 :: 201.5 : x = \$382.85 \end{array} \quad \frac{\overset{1.9}{.95} \times \overset{.5}{201.5}}{\underset{.5}{.95}} = \$382.85 \text{ Ans.}$$

(27)

$$\begin{array}{ccc} \text{bu.} & \text{bu.} & \\ 3.5 : 26.25 :: 8.40 : x = \$63.00 \end{array} \quad \frac{\overset{1.20}{26.25} \times \overset{.5}{8.40}}{\underset{.5}{3.5}} = \$63.00 \text{ A.}$$

(28)

$$2.5 \times 20 = 50 \text{ cwt.} : 1 \text{ cwt.} :: \$1.80 : x = \$.036$$

$$\frac{\overset{.18}{1} \times \overset{.18}{1.80}}{\underset{5}{50}} = \frac{.18}{5} = \$.036 \text{ Ans.}$$

(29)

$$\frac{1}{2} \text{ yd.} : 447 \times 5\frac{1}{2} = \frac{4917}{2} \text{ yd.} :: \$2.16 : x$$

$$\frac{\overset{.72}{4917}}{2} \times \frac{\overset{2}{2.16}}{1} \times \frac{\overset{2}{1}}{\underset{\$}{3}} = \$7080.48 \text{ Ans.}$$

(30)

$$\begin{array}{ccc} \text{oz.} & \text{oz.} & \\ \frac{5}{7} : \frac{3}{2} :: \frac{11}{2} : x = \$1.925 \end{array} \quad \frac{3}{2} \times \frac{11}{2} \times \frac{7}{5} = \frac{231}{10} = 1.925 \text{ A.}$$

(31)

$$\begin{array}{ccc} \text{lb.} & \text{lb.} & \\ \frac{44}{3} : \frac{84}{5} :: \frac{11}{6} : x = \$2.10 \end{array} \quad \frac{\overset{21}{84}}{5} \times \frac{\overset{11}{11}}{6} \times \frac{\overset{3}{3}}{\underset{44}{44}} = \frac{21}{10} = \$2.10 \text{ A.}$$

(32)

$$\begin{array}{ccc} \text{yd.} & \text{yd.} & \$ \\ 29 & : \frac{315}{8} :: \frac{58}{3} & : x = \$52.50 \end{array}$$

$$\frac{105}{\frac{8}{2}} \times \frac{2}{3} \times \frac{2}{29} = \frac{105}{2} = \$52.50 \text{ A.}$$

(33)

$$\begin{array}{ccc} \text{bbl.} & \text{bbl.} & \$ \\ 7 & : \frac{11}{14} :: \frac{9}{11} & : x \end{array}$$

$$\frac{11}{14} \times \frac{9}{11} \times \frac{4}{7} = \frac{36}{49} \text{ Ans.}$$

(34)

$$\begin{array}{ccc} \text{sh.} & \text{sh.} & \$ \\ \frac{3}{16} & : \frac{15}{32} :: 2880 & : x = \$7200 \end{array}$$

$$\frac{5}{32} \times \frac{1440}{1} \times \frac{16}{3} = \$7200$$

(35)

$$\begin{array}{ccc} \text{yd.} & \text{yd.} & \$ \\ 462 & : 116\frac{1}{4} :: 150.66 & : x = \$37.909 + \end{array}$$

$$\frac{155}{462} \times \frac{75.33}{150.66} \times \frac{1}{\frac{462}{154}} = \$37.909 + \text{ Ans.}$$

(36)

The work of 6 men and 3 boys equals  $7\frac{1}{2}$  times the work of one man; the work of 9 men and 4 boys equals that of 11 men;

$$\begin{array}{ccc} \text{men.} & \text{men.} & \text{da.} \\ 11 & : 7\frac{1}{2} :: 330 & : x = 225 \text{ da.} \end{array}$$

$$\frac{15}{2} \times \frac{330}{1} \times \frac{1}{11} = 225 \text{ da. A.}$$

(37)

$$\begin{array}{ccc} \text{men.} & \text{men.} & \text{da.} \\ 16 & : 4 :: 80 & : x = 20 \text{ da.} \end{array}$$

$$\frac{4 \times 80}{16} = 20 \text{ da. Ans.}$$

(38)

$$\begin{array}{ccc} \text{men.} & \text{men.} & \text{da.} \\ 7 & : 21 :: 18 & : x = 54 \text{ da. Ans.} \end{array}$$

$$\frac{3}{21} \times 18 = 54 \text{ da. Ans.}$$



$$\begin{array}{rcccl} & & & (39) & \\ \text{men.} & \text{men.} & \text{da.} & & \\ 10 : 20 :: 6 : x = 12 \text{ da.} & & & \frac{2}{20 \times 6} = 12 \text{ da.} \text{ Ans.} \end{array}$$

$$\begin{array}{rcccl} & & & (40) & \\ \text{men.} & \text{men.} & \text{da.} & & \\ 20 : 10 :: 12 : x = 6 \text{ da.} & & & \frac{6}{10 \times 12} = 6 \text{ da.} \text{ Ans.} \end{array}$$

$$\begin{array}{rcccl} & & & (41) & \\ \text{men.} & \text{men.} & \text{da.} & & \\ 75 : 100 :: 120 : x = 160 \text{ da.} & & & \frac{4}{100 \times 120} = 160 \text{ da.} \text{ Ans.} \end{array}$$

$$\begin{array}{rcccl} & & & (42) & \\ \text{hr.} & \text{hr.} & \text{da.} & & \\ 11.9 : 13.566 :: 35.5 : x = 40.47 \text{ da.} \end{array}$$

$$\frac{13.566 \times 35.5}{11.9} = 40.47 \text{ da.} \text{ Ans.}$$

$$\begin{array}{rcccl} & & & (43) & \\ \text{per.} & \text{per.} & \text{yr.} & & \\ 5 : 50 :: 1 : x = 10 \text{ yr.} & & & \frac{50 \times 1}{5} = 10 \text{ yr.} \text{ Ans.} \end{array}$$

$$\begin{array}{rcccl} & & & (44) & \\ \text{hr.} & \text{hr.} & \text{da.} & & \\ 9 : 4 :: 12 : x = 5\frac{1}{3} \text{ da.} & & & \frac{4 \times 12}{9} = 5\frac{1}{3} \text{ Ans.} \end{array}$$

$$\begin{array}{rcccl} & & & (45) & \\ \text{bbl.} & \text{bbl.} & \$ & & \\ \frac{24}{11} : \frac{162}{5} :: \frac{125}{4} : x = \$132.589 \end{array}$$

$$\frac{27}{562} \times \frac{25}{125} \times \frac{11}{84} = \$132.589 \text{ Ans.}$$

(46)

$$\begin{array}{ccccccc} & \text{bu.} & \text{pk.} & & & & \\ 1.9375 : 96.875 :: 2 & 1 : x \\ & \frac{4}{9} & & & \frac{96.875 \times 2}{1.9375} = 112\frac{1}{2} \text{ bu. } \textit{Ans.} \end{array}$$

(47)

$$\begin{array}{ccccccc} \text{yd.} & \text{yd.} & & \text{\$} & & & \\ \frac{5}{8} : 1\frac{1}{2} :: 1\frac{1}{9} : x = \$18.66\frac{2}{3} \\ & & \frac{4}{3} & & & & \\ \frac{1\frac{1}{2}}{2} \times \frac{14}{9} \times \frac{\frac{4}{3}}{\frac{5}{8}} = \frac{56}{3} = \$18.66\frac{2}{3} \textit{ Ans.} \end{array}$$

(48)

$$\begin{array}{ccccccc} \text{yd.} & \text{yd.} & & \text{\$} & & & \\ 47.5 : 37.05 :: 72.25 : x = \$56.355 \\ & & & \frac{37.05 \times 72.25}{47.5} = \$56.355 \textit{ Ans.} \end{array}$$

(49)

$$\begin{array}{ccccccc} \text{pa.} & \text{pa.} & \text{yd.} & & & & \\ 3 : 160 :: 2 : x = 106\frac{2}{3} \text{ yd.} & \frac{160 \times 2}{3} = 106\frac{2}{3} \text{ yd. } \textit{Ans.} \end{array}$$

(50)

$$\begin{array}{ccccccc} \text{guin.} & \text{s.} & \text{£} & \text{s.} & \text{wk.} & & \\ \frac{1}{2} = 10\frac{1}{2} : 21 = 420 :: 1 : x = 40 \text{ wk.} & \frac{20}{420 \times 1 \times 2} = 40 \text{ wk.} \end{array}$$

(51)

$$\begin{array}{ccccccc} \text{doz.} & \text{copies.} & \text{copies.} & & \text{\$} & & \\ 12 = 144 : 297 :: 54.72 : x & \frac{33}{297 \times 54.72} = \$112.86 \\ & & & & \frac{144}{16} & & \end{array}$$

(52)

$$\begin{array}{ccccccc} \text{men.} & \text{men.} & & \text{\$} & & & \\ 900 : 4500 :: 3618 : x = \$18090 \\ & & 5 & & & & \\ \frac{4500 \times 3618}{900} = \$18090 \textit{ Ans.} \end{array}$$



(58)

$$\begin{array}{c}
 \text{oz.} \quad \text{oz.} \quad \text{lb.} \\
 14\frac{3}{4} : 154\frac{7}{8} \times 16 :: 1 : x = 168 \text{ lb.} \\
 \frac{21}{\cancel{1239}} \times \frac{2}{\cancel{16}} \times \frac{4}{59} = 168 \text{ lb. } \textit{Ans.}
 \end{array}$$

(59)

$$\begin{array}{c}
 \text{gal.} \quad \text{gal.} \quad \text{pt.} \\
 1 : 100 :: \frac{15}{2} : x = 93\frac{3}{4} \text{ gal.} \\
 \frac{50}{\cancel{100}} \times \frac{15}{2} = 750 \text{ pt.} = 93\frac{3}{4} \text{ gal. } \textit{Ans.}
 \end{array}$$

(60)

23-19=4 miles gain and 96 to be gained.

$$\begin{array}{c}
 \text{ml.} \quad \text{ml.} \quad \text{ml.} \\
 4 : 96 :: 23 : x = 552 \text{ miles.} \quad \frac{96 \times 23}{4} = 552 \text{ miles. } \textit{Ans.}
 \end{array}$$

(61)

$$\begin{array}{c}
 \text{mins.} \quad \text{mins.} \\
 \frac{3}{4} \text{ of } \frac{5}{7} = \frac{15}{28} : 1 :: \$9345 : x = \$17444 \\
 \frac{623}{\cancel{9345}} \times \frac{28}{\cancel{15}} = \$17444 \textit{ Ans.}
 \end{array}$$

(62)

The minute hand goes 12 times as fast as the hour hand: hence it gains 11 minute spaces while the hour hand moves over one. At six, the hour hand is 30 spaces ahead: how far does it move before it is overtaken?

$$\begin{array}{c}
 \text{spaces.} \quad \text{spaces.} \quad \text{space.} \quad \text{spaces.} \\
 11 : 30 :: 1 : x = 30 \div 11 = 2\frac{8}{11} \text{ spaces;} \\
 \text{Time 6 o'clock 32 minutes } 43\frac{7}{11} \text{ seconds. } \textit{Ans.}
 \end{array}$$

$$\begin{array}{ccc} \text{ft.} & \text{ft.} & \text{ft.} \\ 7 : 196 :: 5 : x = 140 \text{ ft.} \end{array} \quad (63) \quad \frac{28}{196 \times 5} = 140 \text{ ft. } \textit{Ans.}$$

(64)

A does  $\frac{1}{3}$  of the work in 1 day,B "  $\frac{1}{4}$  " " 1 "C "  $\frac{1}{6}$  " " 1 "

$$\frac{1}{3} + \frac{1}{4} + \frac{1}{6} = \frac{9}{12} = \frac{3}{4} = 1 \text{ day's work of all ;}$$

$$\begin{array}{ccc} \text{work.} & \text{work.} & \text{da.} \\ \frac{3}{4} : 1 :: 1 : x = 1\frac{1}{3} \text{ da.} \end{array} \quad 1 \div \frac{3}{4} = \frac{4}{3} = 1\frac{1}{3} \text{ da. } \textit{Ans.}$$

(65)

A does  $\frac{1}{15}$  of the work in 1 day,A and C do  $\frac{1}{9}$  " " 1 "

$$\frac{1}{9} - \frac{1}{15} = \frac{2}{45} = \text{what C does in 1 day.}$$

$$\begin{array}{ccc} \text{work.} & \text{work.} & \text{da.} \\ \frac{2}{45} : 1 :: 1 : x = 22\frac{1}{2} \text{ da.} \end{array} \quad 1 \times \frac{45}{2} = 22\frac{1}{2} \text{ da. } \textit{Ans.}$$

(66)

$$\begin{array}{ccc} \text{da.} & \text{da.} & \text{men.} \\ 40\frac{2}{3} : 15\frac{1}{4} :: 120 : x = 45 \text{ men.} \end{array}$$

$$\frac{61}{4} \times \frac{120}{1} \times \frac{3}{122} = 45 \text{ men } \textit{Ans.}$$

(67)

1 colt =  $\frac{3}{5}$  horse ;

$$\begin{array}{ccc} \text{horses.} & \text{hor.} & \text{da.} \\ 8\frac{4}{5} : 3 :: 40 : x = 13\frac{7}{11} \end{array}$$

7 horses + 3 colts =  $8\frac{4}{5}$  horses ;

$$\frac{10}{40} \times 3 \times \frac{5}{44} = \frac{150}{11} = 13\frac{7}{11} \text{ da.}$$

(68)

$$\begin{array}{cccc} \text{hr.} & \text{hr.} & \text{da.} & \text{da.} \\ 12\frac{1}{4} & : 10\frac{1}{2} & :: 24 & : x = 20\frac{4}{7} \end{array} \quad \frac{\overset{3}{21} \times \overset{12}{24} \times \frac{4}{1} = \frac{144}{7} = 20\frac{4}{7} \text{ Ans.}}$$

(69)

$$\begin{array}{cccc} \text{rd.} & & & \\ 15 & : 4 & :: 40 & : x = 6\frac{2}{3} \text{ rd.} \end{array} \quad \frac{\frac{4 \times 40}{15} = \frac{32}{3} = 10\frac{2}{3} \text{ rd. Ans.}}$$

(70)

$$\begin{array}{cccc} \text{hr.} & \text{hr.} & \text{da.} & \\ 9 & : 12 & :: 10 & : x = 13\frac{1}{3} \text{ da.} \end{array} \quad \frac{\overset{4}{12} \times 10 = \frac{40}{3} = 13\frac{1}{3} \text{ da. Ans.}}$$

(71)

$$\begin{array}{cccc} \text{ml.} & \text{ml.} & \text{cwt.} & \\ 20 & : 36 & :: 4\frac{1}{2} & : x = 8\frac{1}{10} \text{ cwt.} \end{array} \quad \frac{\overset{9}{36} \times \frac{9}{2} \times \frac{1}{20} = \frac{81}{10} = 8\frac{1}{10} \text{ cwt.} = 810 \text{ lb. Ans.}}$$

(72)

$$\begin{array}{cccc} \text{wks.} & \text{wks.} & \text{horses.} & \text{horses.} \\ 90 & : 7\frac{1}{2} & :: 72 & : x = 6 \end{array} \quad \frac{\frac{15}{2} \times \frac{12}{1} \times \frac{1}{90} = 6 \text{ horses. Ans.}}$$

(73)

From 12 o'clock Monday to 10 hr. 15 min. on Saturday is  
4 da. 22 hr. 15 min.

$$\begin{array}{ccccccc} \text{da.} & \text{da.} & \text{hr.} & \text{min.} & & \text{min. sec.} & \\ 1 & : & 4 & 22 & 15 & :: & 3 & 10 & : & x = 15 \text{ min. } 36\frac{7}{8} \text{ sec. gain;} \\ & & & & & & & & & \text{to which add the 10 minutes} = 25 \text{ min. } 36\frac{7}{8} \text{ sec.;} \end{array}$$

10 hr. 15 min.

25 min.  $36\frac{7}{8}$  sec.

10 hr. 40 min.  $36\frac{7}{8}$  sec. Ans.

(74)

B travels  $11\frac{1}{2}$  yards per minute, and gains upon A,  $\frac{1}{3}$  of a yard;

$536 \div 2 = 268$  yards, the whole distance to be gained;

•  $\frac{1}{3} : 268 :: 11 : x = 8844$  yards that A must travel to before overtaken by B;

$8844 \div 536 = 16\frac{1}{2}$  that he must travel around the wood.

## DOUBLE RULE OF THREE.

(1)

$$125 : 243 :: \frac{75}{2} :: x$$

$$\frac{27 \quad 3}{243 \times 75 \times 2} = \frac{81}{5} = 16\frac{1}{5} \text{ da. Ans.}$$

(2)

$$5 : 15 :: \frac{400}{12} : x \quad \frac{15 \times 400 \times 12}{5 \times 2} = 7200 \text{ Ans.}$$

(3)

$$\frac{12}{8} : \frac{15}{10} :: 120 : x = 187\frac{1}{2}$$

$$\frac{15 \times 10 \times 120}{8 \times 2} = \frac{375}{2} = 187\frac{1}{2} \text{ Ans.}$$

(4)

$$\frac{6}{14} : \frac{12}{9} :: 16 : x = 72 \quad \frac{2 \quad 4}{12 \times 9 \times 16} = 72 \text{ Ans.}$$

(5)

$$\begin{array}{rcccl} 60 & : & 30 & :: & 40 : x=10 \\ 48 & : & 24 & & \end{array} \quad \frac{10}{30} \times \frac{24}{40} \times \frac{40}{60} = 10 \text{ da. Ans.}$$

(6)

$$\begin{array}{rcccl} 36 & & 864 & & \\ 8 & : & 6 & :: & 4 : x=92\frac{1}{2} \\ 4 & & 3 & & \\ 48 & & 82 & & \end{array}$$

$$\frac{24}{36} \times \frac{3}{8} \times \frac{41}{32} \times \frac{4}{4} = \frac{369}{4} = 92\frac{1}{2} \text{ da. Ans.}$$

(7)

$$\begin{array}{rcccl} 80 & & 30 & & \\ 3\frac{1}{2} & : & 12 & :: & 84 : x=36 \\ 150 & & 50 & & \end{array}$$

$$\frac{3}{80} \times \frac{4}{12} \times \frac{21}{50} \times \frac{84}{8} = 36 \text{ Ans.}$$

(8)

$$\begin{array}{rcccl} 6 & & 9 & & \\ 1 & : & 12.5 & :: & 15.6 : x=292.5 \\ & & & & \end{array} \quad \frac{2.6}{6} \times \frac{9 \times 12.5 \times 15.6}{1} = 292.5 \text{ gal.}$$

(9)

$$\begin{array}{rcccl} 19 & & 7 & & \\ 14 & : & 494 & :: & 12 : x=156 \\ & & & & \end{array} \quad \frac{26}{14} \times \frac{6}{494} \times \frac{12}{7} = 156 \text{ tailors.}$$

(10)

$$\begin{array}{rcccl} 45 & & 35 & & \\ 14 & : & 24 & :: & 3600 : x=9600 \\ 1 & & 2 & & \end{array}$$

$$\frac{7}{45} \times \frac{24}{35} \times \frac{2}{2} \times \frac{400}{3600} = 9600 \text{ men. Ans.}$$



(11)

$$1s. \ 9d.=21 \quad \begin{matrix} 20 \\ : \end{matrix} \quad \begin{matrix} 7 \\ 30 \end{matrix} \quad :: \quad 100 : x=50$$

$$\frac{\begin{matrix} 10 & 5 \\ 7 \times 30 \times 100 \end{matrix}}{20 \times 21} = 50 \text{ men. } Ans.$$

(12)

$$\begin{matrix} 4800 \\ 45 \end{matrix} : \begin{matrix} 3600 \\ 34 \end{matrix} :: 24 : x=13\frac{3}{5}$$

$$\frac{\begin{matrix} 3 & 2 \\ 3600 \times 34 \times 24 \end{matrix}}{\begin{matrix} 4800 \times 45 \\ 4 & 5 \end{matrix}} = \frac{68}{5} = 13\frac{3}{5} \text{ oz. } Ans.$$

(13)

$$\begin{matrix} 12\frac{1}{2} \\ 1\frac{3}{4} \end{matrix} : \begin{matrix} 15 \\ 2\frac{1}{2} \end{matrix} :: 5000 : x$$

$$\frac{15}{1} \times \frac{5}{2} \times \frac{\begin{matrix} 200 \\ 5000 \end{matrix}}{1} \times \frac{2}{25} \times \frac{4}{7} = 8571\frac{3}{7} \text{ planks. } Ans.$$

(14)

$$\begin{matrix} 9 \\ 24 \end{matrix} : \begin{matrix} 12 \\ 18 \end{matrix} :: 3 : x=3 \quad \frac{\begin{matrix} 2 \\ 12 \times 18 \times 3 \end{matrix}}{9 \times 24} = 3 \text{ hr. } Ans.$$

(15)

$$\begin{matrix} 13 \\ 7\frac{1}{2} \end{matrix} : \begin{matrix} 20 \\ 15\frac{1}{3} \end{matrix} :: 149.76 : x=471.04$$

$$\frac{\begin{matrix} 4 \\ 20 \end{matrix}}{1} \times \frac{46}{4} \times \frac{\begin{matrix} 1.28 \\ 11.52 \end{matrix}}{1} \times \frac{1}{13} \times \frac{2}{15} = \$471.04 \text{ } Ans.$$

3

(16)

$$\begin{array}{r} 264 \\ 10\frac{2}{7} \end{array} : \begin{array}{r} 129\frac{3}{5} \\ 12\frac{1}{2} \end{array} :: 6\frac{3}{5} : x = 31\frac{5}{8}$$

$$\frac{9}{\cancel{648}} \times \frac{25}{2} \times \frac{33}{5} \times \frac{1}{\cancel{264}} \times \frac{7}{72} = 31\frac{5}{8} \text{ da. } Ans.$$

(17)

$$\begin{array}{r} 15 \\ 9 \\ 30 : 50 \\ 2 \\ 4 \end{array} \begin{array}{r} 12 \\ 3 \\ 4\frac{1}{2} \\ 6 \end{array} :: 120 : x = 180$$

$$\frac{\cancel{12} \times \cancel{3} \times \cancel{50} \times 4\frac{1}{2} \times \cancel{6} \times \cancel{120}}{\cancel{15} \times \cancel{9} \times \cancel{30} \times 2 \times \cancel{4}} = 180 \text{ men. } Ans.$$

(18)

$$\begin{array}{r} 80 \\ 15 \end{array} : \begin{array}{r} 175 \\ 9 \end{array} :: 10 : x = 13\frac{1}{8} \quad \frac{35}{\cancel{175}} \times \frac{3}{\cancel{9}} \times \frac{10}{\cancel{15}} = 13\frac{1}{8} \text{ in. } A.$$

(19)

500-200=300 miles remaining ;

$$\begin{array}{r} 200 \\ 10 \end{array} : \begin{array}{r} 300 \\ 12 \end{array} :: 8 : x = 14\frac{2}{3} \quad \frac{300 \times 12 \times 8}{200 \times 10} = \frac{72}{5} = 14\frac{2}{3} \text{ da.}$$

(20)

1000+600=1600 increased garrison ;

$$\begin{array}{r} 1600 \\ 42 \end{array} : \begin{array}{r} 1000 \\ 28 \end{array} :: 18 : x = 7\frac{1}{2} \quad \frac{5}{\cancel{1000}} \times \frac{2}{\cancel{28}} \times \frac{3}{\cancel{18}} = 7\frac{1}{2} \text{ oz.}$$

(21)

$$\begin{array}{rcl} 5 & 7 & \\ 2\frac{1}{2} : 3 & :: & 45 : x = 97\frac{1}{2} \\ 1\frac{3}{4} & 2\frac{1}{4} & \end{array}$$

$$\frac{4}{7} \times 3 \times 2\frac{1}{4} \times 45 = 97\frac{1}{2} \text{ lb. Ans.}$$

(22)

$$\begin{array}{rcl} 10 & 5 & \\ 7 & 14 & \\ 20 : 40 & :: & 16 : x = \\ 24 & 16 & \\ 50 & 60 & \\ 40 & 50 & \end{array}$$

$$\frac{5 \times 14 \times 40 \times 16 \times 60 \times 50 \times 16}{10 \times 7 \times 20 \times 24 \times 50 \times 40} = 32 \text{ da. Ans.}$$

(23)

$$50000 - 18000 = 32000 = \text{remainder};$$

$$\begin{array}{rcl} 18000 : 32000 & :: & 12 : x = \\ 4 & 6 & \end{array}$$

$$\frac{32000 \times 6 \times 12}{18000 \times 4} = 32 \text{ horses. Ans.}$$

(24)

$$\begin{array}{rcl} 24 & 248 & \\ 9 & 11 & \\ 7 & 4 & \\ 232\frac{1}{2} : 337\frac{1}{2} & :: & 5\frac{1}{2} : x = 132 \\ 3\frac{1}{2} & 5\frac{3}{2} & \\ 2\frac{1}{2} & 3\frac{1}{2} & \end{array}$$

$$\frac{4}{248} \times \frac{11}{1} \times \frac{4}{1} \times \frac{675}{2} \times \frac{7}{5} \times \frac{7}{2} \times \frac{1}{24} \times \frac{1}{9} \times \frac{1}{7} \times \frac{2}{465} \times \frac{3}{11} \times \frac{3}{7} \times \frac{11}{2} =$$

132 da. Ans.

## PARTNERSHIP.

(2)

$$7500 : 2500 :: 3000 : x = \$1000, \text{A's};$$

$$7500 : 3000 :: 3000 : x = \$1200, \text{B's};$$

$$7500 : 2000 :: 3000 : x = \$800, \text{C's}.$$

(3).

$$4200 : 3600 :: 2000 : x = \$1714.28\frac{1}{7}, \text{A's};$$

$$4200 : 600 :: 2000 : x = \$285.71\frac{1}{7}, \text{B's}.$$

(4)

Since \$80 is to be paid out of the profits for expenses, the net profits will be \$15920.

$$40000 : 10000 :: 15920 : x = \$3980; 3980 + 50 = \$4030, \text{A's};$$

$$40000 : 10000 :: 15920 : x = \$3980, \text{B's};$$

$$40000 : 10000 :: 15920 : x = \$3980, \text{C's};$$

$$40000 : 10000 :: 15920 : x = \$3980; 3980 + 30 = \$4010, \text{D's}.$$

(5)

$$2200 : 500 :: 440 : x = 100, \text{A's};$$

$$2200 : 700 :: 440 : x = 140, \text{B's};$$

$$2200 : 1000 :: 440 : x = 200, \text{C's}.$$

(6)

$$18000 : 5000 :: 12000 : x = \$3333.33\frac{1}{3}, \text{First};$$

$$18000 : 4500 :: 12000 : x = \$3000 \quad \text{Second};$$

$$18000 : 4500 :: 12000 : x = \$3000 \quad \text{Third};$$

$$18000 : 4000 :: 12000 : x = \$2666.66\frac{2}{3} \quad \text{Fourth}.$$

(7)

As each son was to have but one half as much as the mother, so the surviving son will have but one part, while the mother will have two parts of the legacy, or the son will have  $\frac{1}{2}$  and the mother  $\frac{2}{2}$  of \$4500.

$$3 : 1 : 4500 : x = \$1500, \text{ the son's share ;}$$

$$3 : 2 : 4500 : x = \$3000, \text{ the mother's share.}$$

(8)

$$\begin{aligned} \text{A's gain} + \text{B's} + \text{C's} &= \$4320.50 + 5245.75 + 3600.75 = \$13167 ; \\ \$15000 - \$13167 &= \$1833 = \text{D's gain.} \end{aligned}$$

Since each share of the gain is to the whole gain as each share of the stock is to the whole stock, we have

$$1833 : 15000 :: 5499 : \$45000, \text{ the whole capital.}$$

$$15000 : 4320.50 :: 45000 : x = \$12961.50, \text{ A's stock ;}$$

$$15000 : 5245.75 :: 45000 : x = \$15737.25, \text{ B's stock ;}$$

$$15000 : 3600.75 :: 45000 : x = \$10802.25, \text{ C's stock.}$$

$$\$15000 - 13167 = \$1833, \text{ D's gain.}$$

(9)

A owned  $\frac{3}{12}$ , B  $\frac{4}{12}$ , and C  $\frac{5}{12}$  of the mill ;  $4300 - 2500 =$   
\$1800, the whole loss.

$$12 : 3 : 1800 : x = 450, \text{ A's share ;}$$

$$12 : 4 : 1800 : x = 600, \text{ B's loss ;}$$

$$12 : 5 : 1800 : x = 750, \text{ C's loss.}$$

(10)

$5 + 7 + 8 = 20$  ; then A must have  $\frac{5}{20}$ , B  $\frac{7}{20}$ , and C  $\frac{8}{20}$  of \$16970.

$$20 : 5 : 16970 : x = \$4242.50, \text{ A's stock ;}$$

$$20 : 7 : 16970 : x = \$5939.50, \text{ B's stock ;}$$

$$20 : 8 : 16970 : x = \$6788, \text{ C's stock.}$$

C's stock, \$6788, is equal to the whole gain, and each must have the same part of the whole gain as of the whole stock.

$$20 : 5 :: 6788 : x = \$1697, \text{ A's gain ;}$$

$$20 : 7 :: 6788 : x = \$2375.80, \text{ B's gain ;}$$

$$20 : 8 :: 6788 : x = \$2715.20, \text{ C's gain.}$$

(11)

$$475.50 + 362.125 + 250.875 + 140 = \$1228.50$$

$$1228.50 : 475.50 :: 614.25 : x = \$237.75, \text{ A's ;}$$

$$1228.50 : 362.125 :: 614.25 : x = \$181.0625, \text{ B's ;}$$

$$1228.50 : 250.875 :: 614.25 : x = \$125.4375, \text{ C's ;}$$

$$1228.50 : 140 :: 614.25 : x = \$70, \text{ D's.}$$

(12)

$$\frac{3}{5}, \frac{4}{5}, \frac{1}{3}, \frac{7}{15} = \frac{27}{45}, \frac{20}{45}, \frac{15}{45}, \frac{21}{45}, \text{ which added, gives } \frac{83}{45}.$$

Then the four persons agreed to do 83 parts of the work, of which A would do 27, B 20, C 15, and D 21, and each must therefore receive like parts of the amount paid.

$$83 : 27 :: 270 : x = \$87.831 + \text{A's ;}$$

$$83 : 20 :: 270 : x = \$65.060 + \text{B's ;}$$

$$83 : 15 :: 270 : x = \$48.795 + \text{C's ;}$$

$$83 : 21 :: 270 : x = \$68.313 + \text{D's.}$$

(13)

$$18500 + 24650 = \$43150 ; 50000 - 43150 = \$6850 = \text{C's stock ;}$$

$$\frac{1}{16} \text{ of } 7360 = \$460 = \text{C's extra allowance ; } 7360 - 460 = \$6900, \\ \text{net gain to be divided.}$$

$$50000 : 18500 :: 6000 : x = \$2553, \text{ A's profit ;}$$

$$50000 : 24650 :: 6900 : x = \$3401.70, \text{ B's profit ;}$$

$$50000 : 6850 :: 6900 : x = \$945.30 ; 945.30 + 460 = \\ \$1405.30, \text{ C's profit.}$$

(14)

$$10500 + 16500 = \$27000, \text{ entire stock ;}$$

$29400 - 4750 = \$24650$ , amount at the beginning of the new year, and of which each has the same part as he originally put into the concern ; hence,

$$27000 : 10500 :: 24650 : x = \$9586\frac{1}{3}, \text{ A's stock ;}$$

$$27000 : 16500 :: 24650 : x = \$15063\frac{2}{3}, \text{ B's stock.}$$

(15)

The fractions  $\frac{1}{2}$ ,  $\frac{3}{5}$ , and  $\frac{7}{10}$ , reduced to their least common denominator, are  $\frac{5}{10}$ ,  $\frac{6}{10}$ , and  $\frac{7}{10}$ ; and hence, the sums are proportional to the whole numbers, 5 6, and 7.

$5+6+7=18$ , the smallest sum of proportional numbers.

But since the number which denotes each share is taken twice, eighteen denotes *twice* the number of shares; hence, the number of shares is denoted by 9.

Now, the sum of the 1st and 2d shares is 5, that of the 1st and 3d 6, and that of the 2d and 3d, 7; therefore, the second share is greater by 1 than the first, and the third, 1 greater than the second; hence, the shares, taken in order, differ from each other by 1; and since their sum is 9, 2, 3, and 4, denote the respective shares.

$$9 : 2 :: 4569 : x = \$1015.33\frac{1}{3}, \text{ the first ;}$$

$$9 : 3 :: 4569 : x = \$1523, \text{ the second ;}$$

$$9 : 4 :: 4569 : x = \$2030.66\frac{2}{3}, \text{ the third.}$$

(2)

$$7 \times 3 = 21 \qquad 90 : 21 :: 70.20 : x = \$16.38, \text{ A's ;}$$

$$9 \times 5 = 45 \qquad 90 : 45 :: 70.20 : x = \$35.10, \text{ B's ;}$$

$$4 \times 6 = 24 \qquad 90 : 24 :: 70.20 : x = \$18.72, \text{ C's.}$$

$$\frac{90}{90}$$

(3)

The profits of each partner are to each other in the compound ratio of each one's stock and time; hence,

$$3000 : 2100 :: 10000 : x$$

$$12 : 8$$

$$\frac{7 \quad 125}{100 \times 10000 \times 12} = \$10500, \text{ B's capital} = \text{value of 1500 barrels of flour ;}$$

$$\frac{3000 \times 8}{10}$$

$$10500 \div 1500 = \$7, \text{ cost per barrel. Ans.}$$

(4)

<p>A had \$23000 for 2 months, and \$21200 for 10 mo.; hence,</p> $\begin{array}{r} 23000 \times 2 = 46000 \\ 21200 \times 10 = 212000 \\ \hline \$258000, \text{ A's;} \end{array}$	<p>B had \$13500 for 4 months, and \$3500 for 5 mo.; hence,</p> $\begin{array}{r} 13500 \times 4 = 54000 \\ 3500 \times 5 = 17500 \\ \hline \$71500, \text{ B's;} \end{array}$
--	--

258000

71500

329500 : 258000 :: 8400 :  $x = \$6577.23\frac{4}{9}$ , A's;329500 : 71500 :: 8400 :  $x = \$1822.76\frac{1}{3}$ , B's.

(5)

$4000 \times 12 = 48000$	$133000 : 48000 :: 798 : x = \$228$ , A's;
$3000 \times 15 = 45000$	$133000 : 45000 :: 798 : x = \$270$ , B's;
$5000 \times 8 = 40000$	$133000 : 40000 :: 798 : x = \$240$ , C's.

133000

(6)

If C's gain is  $\frac{1}{12}$  and E's  $\frac{6}{12}$  of the whole, then D's must be  $\frac{5}{12}$  of the whole; then E's share of the gain is to D's, as E's stock for the time it was in trade, is to D's stock for the time it was in trade, and the same for C's; hence,

 $\frac{6}{12} : \frac{5}{12} :: 756 \times 4 : x = 2520$ ;  $2520 \div 9 = \$280$ , D's stock; $\frac{6}{12} : \frac{1}{12} :: 756 \times 4 : x = 504$ ;  $504 \div 3 = \$168$ , C's stock.

(7)

 $3000 \times 9 = 27000$  $4000 \times 9 = 36000$ 

63000, A's.

 $4000 \times 12 = 48000$  $4500 \times 3 = 13500$  $2500 \times 3 = 7500$ 

69000, B's.

 $\$7333\frac{1}{3} \times 6 =$ 44000, C's.

176000

176000 : 63000 :: 7400 :  $x = \$2648.86\frac{4}{11}$ , A's;176000 : 69000 :: 7400 :  $x = \$2901.13\frac{7}{11}$ , B's;176000 : 44000 :: 7400 :  $x = \$1850.$ , C's.



(8)

If \$600 accrue from \$480 in six months, the gain, \$120, would be equal to  $\frac{1}{4}$  the stock, and in 12 months it would be twice as much, or  $\frac{1}{2}$  the stock; therefore, \$1200, B's stock and gain for 12 months, is  $\frac{3}{2}$  of his stock, from which we obtain \$800. for B's stock.

Then B's stock is to C's stock, as B's gain for 12 months is to C's gain for the same time; or,

$$800 : 320 :: 400 : x = \$160, \text{ C's gain for 12 months.}$$

$$\$520 - \$320 = \$200, \text{ C's whole gain.}$$

$$160, \text{ gain for 12 mo. : 200 entire gain :: 12 mo. : } x = \\ 15 \text{ mo., C's time.}$$

## P E R C E N T A G E .

.05; .08; .15 $\frac{1}{2}$  or .155; 1.00; 2.04; 3.27 $\frac{1}{2}$ ; 6.723;  
.49; 5.075.

(1)

$$1256 \times .04 = \$50.24 \text{ Ans.}$$

(2)

$$956.50 \times .12 = \$114.78 \text{ Ans.}$$

(3)

$$475 \times .00\frac{1}{4} = 1.1875 \text{ yd. Ans.}$$

(4)

$$324.5 \times .00\frac{7}{8} = 2.839375 \text{ cwt.}$$

(5)

$$125.25 \times .00\frac{4}{5} = 1.0020 \text{ lb. A.}$$

(6)

$$750 \times .016 = 12 \text{ bu. Ans.}$$

(7)

$$2000 \times .045 = \$90.00 \text{ Ans.}$$

(8)

$$186 \times .09 = 16.74 \text{ mi. Ans.}$$

(9)

$$460 \times .10375 = 47.725 \text{ sh. Ans.}$$

(10)

$$540 \times .051 = 27.54 \text{ T. Ans.}$$

(11)

$$3465.75 \times .086\frac{2}{3} = \$300.365 \text{ A.}$$

(12)

$$126 \times .125 = 15.75 \text{ cows. A.}$$

(13)

$$320 \times .50 = 160 \text{ bales.}$$

(14)

$$1275 \times .375 = 478.125 \text{ yd.}$$

(15)

$$4573 \times .95 = \$4344.35. \text{ A.}$$

(16)

$$2500 \times 1.05 = 2625 \text{ bbl. Ans.}$$

(17)

$$4537 \times 1.25 = \$5144.625. \text{ A}$$

(18)

$$5000 \times 2.50 = \$12500$$

(19)

$$1267.875 \times 3.05 = \$3867.01875.$$

(20)

$$3000 \times 5.00 = \$15000 \text{ A.}$$

(21)

$$765 \times .03 = \$22.95 \text{ Ans.}$$

(22)

$$960 \times .04\frac{1}{2} = \$43.20 \text{ Ans.}$$

(23)

$$1500 \times .075 = 112.50$$

$$1000 \times .0475 = 47.50$$

$$\underline{\$65.00}$$

(24)

$$895 \times .17 = 152.15 ; 895 - 152.15 = 742.85 \text{ gallons. Ans.}$$

(25)

$$250 \times .18 = 45. ; 250 - 45 = 205 \text{ boxes. Ans.}$$

(1)

$$2 \div 10 = .20 \text{ Ans.}$$

(2)

$$4 \div 32 = .125 \text{ Ans.}$$

(3)

$$3 \div 40 = .075 \text{ A}$$

(4)

$$17 \div 125 = .136 \text{ A.}$$

(5)

$$36 \div 144 = .25 \text{ A.}$$

(6)

$$84 \div 96 = .875 \text{ A.}$$

$$(7) \quad \frac{1}{2} \div \frac{7}{8} = .57\frac{1}{7} \text{ Ans.}$$

$$(8) \quad 3 \div 400 = .00\frac{3}{4} \text{ Ans.}$$

$$(9) \quad 4\frac{1}{3} \div 9\frac{1}{5} = .47\frac{7}{89}$$

$$(10) \quad 104 \div 312 = .33\frac{1}{3}$$

$$(11) \quad 121.87\frac{1}{2} \div 325 = .37\frac{1}{2}$$

$$(12) \quad 56\frac{1}{4} \div 450 = .12\frac{1}{2}$$

$$(13) \quad \frac{7}{8} \text{ No.} = .87\frac{1}{2} \text{ No.}$$

$$(14) \quad \frac{4}{5} \text{ ship} = .80 \text{ ship}$$

$$(15) \quad \frac{7}{10} \text{ of } 50 = .70 \text{ of } 50$$

$$(16) \quad \frac{2}{3} \text{ cargo} = 66\frac{2}{3}\% \text{ cargo. Ans.}$$

$$(17) \quad 1\frac{1}{2} \text{ No.} = 1.60 \text{ or } 160\% \text{ No.}$$

$$(2) \quad 475 \div .25 = 1900 \text{ Ans.}$$

$$(3) \quad 87\frac{1}{2} \div .125 = 700 \text{ Ans.}$$

$$(4) \quad 560 \div 1.40 = \$400 \text{ Ans.}$$

$$(5) \quad 75 \div .005 = 15000 \text{ Ans.}$$

$$(6) \quad 1.25 \div .00875 = 142.857\frac{1}{7} \text{ Ans.}$$

$$(7) \quad \frac{7}{8} \div .45 = 1.94\frac{4}{9} \text{ Ans.}$$

$$(8) \quad \frac{3}{4} \div .00\frac{5}{8} = \frac{3}{4} \div \frac{5}{8} \text{ of } \frac{1}{100} = \frac{3}{4} \times \frac{800}{5} = 90 \text{ Ans.}$$

$$(9) \quad 5850 \div .75 = \$7800 \text{ Ans.}$$

$$(10) \quad 1647 \div .375 = \$4392 \text{ Ans.}$$

$$(11) \quad 1.00 - .25 = .75 = \text{number of men unhurt ;}$$

$$1560 \div .75 = 20800 \text{ men. Ans.}$$

$$(1) \quad 392 \div 1.01 = 388.1188 + \text{Ans.}$$

$$(2) \quad 10350 \div 1.15 = 9000 \text{ Ans.}$$

(3)

$$1078 \div 1.96 = 550 \text{ sheep } \textit{Ans.}$$

(4)

$$1008 \div 1.33\frac{1}{3} = \$756 \text{ } \textit{Ans.}$$

(5)

$$122 \div 4.05 = \$30.123 + \textit{Ans.}$$

(6)

$$1036 \div 1.40 = \$740 \text{ } \textit{Ans.}$$

(7)

$$85000 \div 2.25 = \$37777.77\frac{7}{8} \text{ } \textit{A.}$$

(8)

$$9180 \div 1.70 = \$5400 \text{ } \textit{Ans.}$$

(9)

$$248 \div 1.55 = \$160 = \text{cost of sheep ; } 160 \div 40 = \$4, \text{ price per hd.}$$

(10)

$$6835.50 \div 1.26 = \$5425 \text{ } \textit{Ans.}$$

(1)

$$136 \div .85 = 160 \text{ marbles. } \textit{A.}$$

(2)

$$615 \div .82 = 750 \text{ sheep. } \textit{Ans.}$$

(3)

$$513 \div .54 = \$950 \text{ } \textit{Ans.}$$

(4)

$$.20 + .15 = .35 \text{ lost ; } 1 - .35 = .65 \text{ remainder ;}$$

$$19500 \times .65 = 30090 \text{ men. } \textit{Ans.}$$

(5)

$$10935 \div .81 = \$13500 \text{ } \textit{Ans.}$$

(6)

$$31250 \div .62\frac{1}{2} = \$50000 \text{ } \textit{Ans.}$$

(7)

$$4200 \div .84 = \$5000 \text{ } \textit{Ans.}$$

(8)

$$2262 \div .87 = \$2600 \text{ } \textit{Ans.}$$

## PROFIT AND LOSS.

(1)

$.07 \times 250 \times 9 = \$157.50$  cost ;  $.07 \times 250 \times 9 = \$191.25$  selling price ;  $191.25 - 157.50 = \$33.75$  gain. *Ans.*

(2)

$.31\frac{1}{4} - 27 = .04\frac{1}{4}$  gain per yd. ;  $.04\frac{1}{4} \times 43 \times 15 = \$27.41\frac{1}{4}$

(3)

$360 \times .75 = \$270$  cost of keeping ;  $1.25 \times 360 = \$450$ , value of wool ;  $.62\frac{1}{2} \times 90 = \$56.25$ , value of lambs ;  
 $(450 + 56.25) - 270 = \$236.25$  gain. *Ans.*

(4)

$5\frac{1}{2} \times 65 = \$357.50$ , cost of flour ;  $357.50 + 42.50 = \$400$ , price ;  $400 \div 65 = \$6.15\frac{5}{13}$ , price per bbl. *Ans.*

(5)

$.62\frac{1}{2} \times 500 = \$312.50$ , cost ;  $312.50 + 35 = \$347.50$ , selling price ;  $347.50 \div 500 = \$6.95$ , price per bu. *Ans.*

(6)

$6450 + 575 + 796 = \$7821$ , entire cost ;  $7821 + 945 = \$8766$ , price. *Ans.*

(7)

After one-third leaked out, 2 hhd. remained, equal to 126 gal.

$68.04 + 2.52 = \$70.56$ , what the remainder must sell for.

$70.56 \div 126 = .56$  cts. per gallon.

(8)

$4162.50 \times .22 = \$915.75$  *Ans.*

(9)

$$(3612 + 54) \times .20 = \$733.20$$

(10)

$$37649 \times .31\frac{1}{2} = \$11765.31\frac{1}{2}$$

(11)

$$2965 \times .15 = \$444.75 \text{ Ans.}$$

(12)

$$\begin{aligned} \frac{1}{10} \text{ of } 8550 &= 855; 855 \times .12 = \$102.60, \text{ loss on } \frac{1}{10} \text{ of flour;} \\ \frac{1}{4} \text{ of } 8550 &= 2137\frac{1}{2}; 2137.50 \times .19 = \$406.125, \text{ gain on } \frac{1}{4}; \\ \frac{1}{10} + \frac{1}{4} &= \frac{4}{40} + \frac{10}{40} = \frac{14}{40}; 1 - \frac{14}{40} = \frac{26}{40} = \frac{13}{20}, \text{ remainder;} \\ \frac{13}{20} \text{ of } 8550 &= 5557.50; 5557.50 \times .30 = \$1667.25 \text{ gain on } \\ 406.125 + 1667.25 &= \$2073.375, \text{ entire gain;} 2073.375 - \\ 102.60 &= \$1970.775 \text{ Ans.} \end{aligned}$$

(13)

$$$.16 \times .12\frac{1}{2} = \$0.02 \text{ Ans.}$$

(14)

$$200000 \times .08 = \$16000.00; 16000 + 2860 = \$18860, \text{ entire profit. Ans.}$$

(15)

$$5\% \text{ of } 25\% = \frac{\$}{100} \text{ of } \frac{25}{100} = \frac{1}{80} = 1\frac{1}{4}\% \text{ Ans.}$$

(16)

$$.75 \times 20 = \$0.15, \text{ gain;} .75 + .15 = \$.90. \text{ Ans.}$$

(17)

$$1 \text{ pipe} = 126 \text{ gallons.}$$

$$322.56 \times .25 = \$70.64; 322.56 + 70.64 = \$393.20;$$

$$393.20 \div 126 = \$3.20 \text{ per gallon.}$$

(18)

$3493.33\frac{1}{3} \times .10 = \$349.333\frac{1}{3}$ ;  $3493.333\frac{1}{3} - 349.333\frac{1}{3} =$   
 $\$3144$ , price;  $3144 \div 3275 = \$0.96$ , price per bu. *Ans.*

(19)

$150.25 \times .40 = \$60.10$  gain;  $150.25 \times .28 = \$42.07$  loss;  
 $60.10 - 42.07 = \$18.03$ , balance of gain.

(20)

$144 - 36 = 108$  gallons remains.

$144 \times .45 = \$64.80$  cost;  $64.80 \times .10 = \$6.48$  gain;  
 $64.80 + 6.48 = \$71.28$ ;  $71.28 \div 108 = \$0.66$  per gal.

(21)

$5 + 3 + 2 + 40 = 50$  per cent. to be gained.

$3500 \times 120 = \$4200$  cost;  $4200 \times .50 = \$2100$  gain;

$4200 + 2100 = \$6300$ ;  $6300 \div 3500 = \$1.80$  per bushel.

(22)

$425 - 348.50 = \$76.50$  whole gain;  $76.50 \div 425 =$   
 $.18$ , or 18 per cent.

(23)

$.07\frac{1}{2} - .06 = .015$  gain;  $.015 \div .06 = .25$  gain per cent.

(24)

$1.20 - .90 = .30$ ;  $.30 \div .90 = .33\frac{1}{3}$  per cent. on the rye.

$1.50 - 1.12\frac{1}{2} = .37\frac{1}{2}$ ;  $.375 \div 1.125 = .33\frac{1}{3}$  " on wheat.

(25)

$20 \times .18 = \$3.60$ , what it sold for per ream;

$\$3.60 - \$2 = \$1.60$ , gain per ream;

$1.60 \div 2 = .80$ , gain per cent.

( 26 )

13 cwt. 3 qr. 14 lb. = 13.89 cwt., or 1389 pounds ;  
 $13.89 \times 8 = \$111.12$ , cost;  $1389 \times .10 = \$138.90$ , what it sold for;  
 $138.90 - 111.12 = \$27.78$ , whole gain ;  
 $27.78 \div 111.12 = .25$ , gain per cent.

( 27 )

45 T. 16 cwt. 25 lb. = 45.8125 tons ;  
 $45.8125 \times 75 = \$3435.9375$ , cost ;  $45.8125 \times 78.50 =$   
 $\$3596.28125$ , what it sold for ;  
 $3596.28125 - 3435.9375 = \$160.34375$ , whole gain ;  
 $160.34375 \div 3435.9375 = .046 + = 4\frac{3}{4}\%$  gain.

( 28 )

$7000 + 425 = \$7425$ , cost of lumber ;  
 Of material there was lost  $\frac{216}{7000}$  of 67560 =  $2084\frac{24}{75}$  ft. ;  
 $67560 - 2084\frac{24}{75} = 65475\frac{51}{75}$ , remainder ;  
 $(65475\frac{51}{75} \div 1000) \times 97.50 = \$6383.840\frac{22}{25}$ , price of lumber ;  
 $7425 - 6383.840\frac{22}{25} = \$1041.15908\frac{4}{5}$

( 29 )

$593.75 - 475 = \$118.75$ , amount of premium on gold, or of  
 discount on paper ;  
 $118.75 \div 475 = .25$ , or 25% premium on gold ;  
 $118.75 \div 593.75 = .20$ , or 20% discount on paper.

( 30 )

\$500 is 31% of what number ?  $500 \div 31 = \$1612.90\frac{9}{11}$  A

( 31 )

$8745 \div .25 = \$14980$  Ans.

( 32 )

$2000 + 1260 = \$4225$ , total profit ;  $4225 \div .40 = 10562.50$



( 33 )

$$4500 + 2500 = \$7000, \text{ total profit ;}$$

$$7000 \div 35 = \$20000, \text{ total sales. } \textit{Ans.}$$

( 34 )

$$32500 \div .12\frac{1}{2} = \$260000 \textit{ Ans.}$$

( 35 )

$$10\% \text{ of } 12\% \text{ of capital} = \frac{10}{100} \text{ of } \frac{12}{100} = \frac{3}{250} = .012 =$$

$$1\frac{1}{8}\% \text{ capital. } \textit{Ans.}$$

( 36 )

$$477.12 \div 1.12 = \$426 \textit{ Ans.}$$

( 37 )

$$340 \div 85 = \$400 \textit{ Ans.}$$

( 38 )

$$195.50 \div 1.15 = \$170 \textit{ Ans.}$$

( 39 )

$$78 \text{ cwt. } 3 \text{ qr. } 14 \text{ lb.} = 7889 \text{ lb. ; } 7889 \times .08 = \$631.12 ;$$

$$631.12 \div 1.15 = \$548.80 \textit{ Ans.}$$

( 40 )

$$472.50 \div 1.35 = \$350, \text{ value of one ;}$$

$$472.50 \div .90 = \$525, \text{ value of other ;}$$

$$472.50 \times 2 = \$945, \text{ price of both ;}$$

$$350 + 525 = \$875, \text{ cost of both ;}$$

$$945 - 875 = \$70 \text{ gain. } \textit{Ans.}$$

( 41 )

$$7 \div 87\frac{1}{2} = \$8, \text{ asking price ; } 8 \div 1.33\frac{1}{3} = \$6 \text{ cost. } \textit{Ans.}$$

(42)

$$3850 \div .88 = \$4375 \text{ Ans.}$$

(43)

$$10 \div 1.25 = \$8, \text{ cost ; } 11.60 - 8 = \$3.60, \text{ whole gain ;}$$

$$3.60 \div 8 = .45 = 45\% \text{ gain. Ans.}$$

(44)

$$25650 \times 19.20 \div 1000 = \$492.48 ; 492.48 \div 1.20 = \$410.40 \text{ cost ;}$$

$$25650 \times 15 \div 1000 = \$384.75 ; 410.40 - 384.75 = \$25.65 \text{ loss.}$$

(45)

$$3881.25 \div 1.125 = \$3450 \text{ cost ;}$$

$$3450 - 3277.50 = \$172.50, \text{ whole loss ;}$$

$$172.50 \div 34.50 = .05 = 5\% \text{ loss. Ans.}$$

(46)

$$.66 = 1.20 = .55 \text{ cost ; } .77 - .55 = .22 \text{ gain on 1 lb ;}$$

$$.22 \div .55 = .40 = 40\% \text{ gain. Ans.}$$

(47)

$$5520 \times .50 = \$2760, \text{ what the corn sold for ;}$$

$$2760 \div .92 = \$3000, \text{ what it cost ;}$$

$$5520 \times .60 = \$3312 ; 3312 - 3000 = \$312, \text{ whole gain ;}$$

$$312 \div 3000 = 10\frac{2}{3} = 10\frac{2}{3}\% \text{ gain. Ans.}$$

(48)

$$1412\frac{1}{2} \times 3 \times .11 = \$466.125 ; 466.125 \div 1.375 = \$339 \text{ cost.}$$

$$339 \times .50 = \$169.50 \text{ gain ; } 339 + 169.50 = \$508.50 \text{ Ans.}$$

## COMMISSION.

(1)

$$7540 \times .025 = \$188.50 \text{ commission ;}$$

$$7540 - 188.50 = \$7351.50 \text{ paid over.}$$

(2)

$$1399.77 \div 1.03 = \$1359 \text{ purchase ;}$$

$$1359 \times .03 = \$40.77 \text{ commission.}$$

(3)

$$(3125 + 1520) \times .0075 = \$34.8375 \text{ Ans.}$$

(4)

$$9.75 \times 750 \times .0225 = \$164.53125 \text{ Ans.}$$

(5)

$$6.50 \times 9.50 \times 96 = \$5928 \text{ cost ; } 5928 \times .01625 = \$96.33 \text{ com. ;}$$

$$5928 - 96.33 = \$5831.67 \text{ Ans.}$$

(6)

$$2\frac{3}{5} + 1\frac{2}{5} = 4 \text{ per cent. commission ;}$$

$$2340 \times 1.75 = \$4095, \text{ first cost of the wheat ;}$$

$$4095 \times .04 = \$163.80, \text{ his commission ;}$$

$$4095 \times .06 = \$245.70, \text{ commission and freight ;}$$

$$\$4095 + \$245.70 = \$4340.70, \text{ entire cost of the wheat.}$$

(7)

$$2564.25 \times .045 = \$115.39 + \text{ Ans.}$$

(8)

$$7320.25 \times .06625 = \$484.9665 ;$$

$$7320.25 - 484.9665 = 6835.283 \text{ Ans.}$$

(9)

$$1000 \times .065 = \$65; 1000 - 65 = 935. \text{ Ans.}$$

(10)

$$3476 \times .12\frac{1}{2} = \$434.50, \text{ the whole amount;}$$

$$434.50 \times .03\frac{1}{8} = 13.578; 434.50 - 13.578 = \$420.922 \text{ Ans.}$$

(11)

$$1500 \times .025 = 37.50$$

$$1000 \times .0325 = \underline{32.50}$$

\$70 amount of loss.

(12)

$$2640 \times .02\frac{3}{4} = \$68.64 \text{ discount; } 2640 - 68.64 = \$2571.36$$

(13)

$$4.75 \times 275 = \$1306.25 \text{ cost; } 20\% + \frac{1}{4}\% + \frac{3}{4}\% = 3\%;$$

$$1306.25 \times .03 = \$39.1875 \text{ charges;}$$

$$1306.25 + 39.1875 = \$1267.0625 \text{ transmitted.}$$

(14)

$$12000 \div 1.02 = \$11764.705 + \text{purchase;}$$

$$12000 - 11764.705 = \$235.295 + \text{commission.}$$

(15)

$$708.75 \div 1.05 = \$675 \text{ purchase money; } 675 \div 45 = 15 \text{ tons}$$

(16)

$$2608.625 \div 1.025 = \$2545 \text{ purchase money;}$$

$$2608.625 - 2545 = \$63.625 \text{ commission;}$$

$$2545 \div .56 = 4544.642 + \text{bushels. Ans.}$$

(17)

$$42.66 = .018 = \$2370 \text{ purchase money ;}$$

$$240 \times .06\frac{1}{4} = \$15, \text{ cost of one barrel ;}$$

$$2370 \div 15 = 158 \text{ barrels ;}$$

$$2370 + 42.60 = \$2412.66, \text{ whole amount.}$$

(18)

$$.02 + .00\frac{1}{8} + .00\frac{1}{8} + .00\frac{1}{10} = .02\frac{17}{40}, \text{ sum of allowances ;}$$

$$187.50 \div 1.02\frac{17}{40} = \$183.0607 + \text{sum expended in cotton ;}$$

$$183.0607 \times .02 = \$3.6612 + \text{commission.}$$

(19)

$$60 \div 2785 = .02\frac{26}{557}, \text{ or } 2\frac{26}{557}\%$$

(20)

$$175 \div 6795 = .02\frac{722}{1359}$$

(21)

$$15 \div 175 = .08\frac{4}{7}, \text{ or } 8\frac{4}{7}\% \text{ A.}$$

(22)

$$5 \div 45 = .11\frac{1}{9}, \text{ or } 11\frac{1}{9}\% \text{ A.}$$

## INTEREST.

(1)

$$675 \times .06\frac{1}{2} = \$43.875 \text{ Ans.}$$

(2)

$$871.25 \times .07 = \$60.9875 \text{ A.}$$

(3)

$$535.50 \times .06 \times 7 = \$224.91 \text{ Ans.}$$

(4)

$$1125.885 \times .08 \times 4 = \$360.2832 \text{ Ans.}$$

(5)

$$789.74 \times .05 \times 12 = \$473.844 \text{ Ans.}$$

(6)

$$2500 \times .07\frac{1}{2} \times 7 = \$1312.50 \text{ Ans.}$$

(7)

$$3153.82 \times .04\frac{1}{2} \times 2 = \$283.8438 \text{ Ans.}$$

(8)

$$199.48 \times .07 \times 16 = \$223.4176 ;$$

$$223.4176 + 199.48 = \$422.8976 \text{ Ans.}$$

(9)

$$897.50 \times .08 \times 3 = \$215.40 ; 215.40 + 897.50 = \$1112.90$$

(10)

$$982.35 \times .06\frac{3}{4} \times 4 = \$265.2345 \text{ Ans.}$$

(11)

$$1500 \times .05\frac{1}{4} \times 5 = \$393.75 ; 393.75 + 1500.00 = 1893.75$$

(12)

$$1914.10 \times .03\frac{1}{4} \times 6 = \$373.2495 \text{ Ans.}$$

(13)

$$350 \times .10 \times 21 = \$735.00 \text{ Ans.}$$

(14)

$$628.50 \times .12\frac{1}{3} \times 5 = \$387.575 ; 387.575 + 628.50 = \$1016.075$$

(15)

$$75.50 \times .06 \times 10 = \$45.30 ; 45.30 + 75.50 = \$120.80 \text{ Ans.}$$

(16)

$$5040 \times .07\frac{1}{2} \times 2 = \$756 ; 5040 + 756 = \$5796 \text{ Ans.}$$

(17)

$$119.48 \times .07 \times 2\frac{1}{2} = \$20.909.$$

(18)

$$250.60 \times .06 \times 1\frac{3}{4} = \$26.313$$

(19)

$$956 \times .09 \times 5\frac{1}{3} = \$458.88 \text{ Ans.}$$

(20)

$$1575.20 \times .07 \times 3\frac{2}{3} = \$404.3013 ;$$

$$404.3013 + 1575.20 = \$1979.5013 \text{ Ans.}$$

(21)

$$5.000 \times .05\frac{1}{2} \times 2\frac{1}{4} = \$618.75 ; 618.75 + 5000 = \$5618.75$$

(22)

$$1508.20 \times .10 \times 4\frac{1}{8} = \$628.416\frac{2}{3} \text{ Ans.}$$

(23)

$$75 \times .12\frac{1}{2} \times 6\frac{5}{8} = \$64.0625 \text{ Ans.}$$

(24)

$$125 \times .04\frac{3}{4} \times 5\frac{1}{2} = \$32.65625 ; 32.65625 + 125 = \$157.65625$$

(2)

$$1 \text{ yr. } 8 \text{ mo. } 6 \text{ da.} = 20.2 \text{ mo. ;}$$

$$358.50 \times .07 = \$25.0950, \text{ interest of 1 year ;}$$

$$25.0950 \div 12 = 2.09125, \text{ interest of 1 month ;}$$

$$2.09125 \times 20.2 = \$42.24325 \text{ Ans.}$$

(3)

$$4 \text{ yr. } 9 \text{ mo. } 15 \text{ da.} = 57.5 \text{ months ;}$$

$$1461.75 \times .06 = \$87.705, \text{ interest of 1 year ;}$$

$$87.705 \div 12 = 7.30875, \text{ interest of 1 month ;}$$

$$7.30875 \times 57.5 = \$420.253125 \text{ Ans.}$$

(4)

$$(1200 \times .07\frac{1}{2} \div 12) \times 28.4 = \$213 \text{ Ans.}$$

(5)

$$(4500 \times .05 \div 12) \times 9.6\frac{1}{2} = \$181.25 \text{ Ans.}$$

(6)

$$(156.25 \times .08 \div 12) \times 10.6 = \$11.0415 \text{ Ans.}$$

(7)

$$(640 \times .06\frac{1}{2} \div 12) \times 38.3 = \$132.7707 \text{ Ans.}$$

(8)

$$(276.50 \times .10 \div 12) \times 11.7 = \$26.9586 + \text{ Ans.}$$

(9)

$$(378.42 \times .07 \div 12) \times 17.1 = \$37.747395 ;$$

$$37.747395 + 378.42 = \$416.167395 \text{ Ans.}$$

(10)

$$(1250 \times .10\frac{1}{4} \div 12) \times 7.7 = \$84.21875, \text{ interest ;}$$

$$84.21875 + 1250 = \$1334.21875 \text{ Ans.}$$

(11)

$$(6500 \times .09\frac{1}{2} \div 12) \times 2.3\frac{1}{2} = \$120.0693 \text{ Ans.}$$

(12)

$$(70.50 \times .05\frac{1}{4} \div 12) \times 130 = \$40.0968 \text{ Ans.}$$

(13)

$$(45 \times .06\frac{1}{4} \div 12) \times 144.9 = \$36.6778 + \text{ interest ;}$$

$$36.6778 + 45 = \$81.6778 + \text{ Ans.}$$

(14)

$$100 \times .04 \div 12) \times 186 = \$62, \text{ interest ; } 62 + 100 = \$162$$



(15)

$$(475.50 \times .08 \div 12) \times 69.8 = \$221.266 \text{ Ans.}$$

(16)

$$(4560 \times .07 \div 12) \times 14.6\frac{1}{3} = \$389.2466 \text{ Ans.}$$

(17)

$$(128.375 \times .06 \div 12) \times 10.9 = \$6.9964 + \text{interest};$$

$$6.9964 + 128.375 = \$135.3714 + \text{Ans.}$$

(18)

$$(264.52 \times .06 \div 12) \times 32.4\frac{2}{3} = \$42.9404 \text{ Ans.}$$

(19)

$$(76.50 \times .06 \div 12) \times 21.4 = \$8.1855, \text{ interest};$$

$$8.1855 + 76.50 = \$84.6855 \text{ Ans.}$$

(20)

$$(241.60 \times .07 \div 12) \times 39.5 = \$55.6685 + \text{Ans.}$$

(21)

$$(5600 \times .07 \div 12) \times 1 = \$32.666\frac{2}{3} \text{ Ans.}$$

(22)

$$(8450 \times .10 \div 12) \times 2 = \$140.8333\frac{1}{3}, \text{ interest};$$

$$140.8333\frac{1}{3} + 8450 = \$8590.8333\frac{1}{3} \text{ Ans.}$$

(23)

$$(4000 \times .09 \div 12) \times 1.2 = \$36.00 \text{ Ans.}$$

(24)

yr.	mo.	da.
1853	10	10
1852	9	9

---

 1 1 1, time.

$$(87.60 \times .06\frac{1}{2} \div 12) \times 13.0\frac{1}{3} = \$6.18431 + ;$$

$$6.18431 + 87.60 = \$93.78431 + \text{Ans.}$$

(25)

yr.	mo.	da.
1858	4	25
1854	7	8

---

 3 9 17, time.

$$(126.75 \times .07 \div 12) \times 45.5\frac{2}{3} = \$33.69085 + ;$$

$$33.69085 + 126.75 = \$160.44085 + \text{Ans.}$$

(26)

yr.	mo.	da.
1856	9	15
1856	1	1

---

 8 14

$$(350 \times .05\frac{1}{4} \div 12) \times 8.4\frac{2}{3} = \$12.96358 + \text{Ans.}$$

(27)

yr.	mo.	da.
1856	12	1
1855	3	14

---

 1 8 17

 Time, less 90 days =  $17.5\frac{2}{3}$  mo.;

$$(560.40 \times .10 \div 12) \times 17.5\frac{2}{3} = \$82.036\frac{1}{3} \text{ Ans.}$$

(28)

$$(1256 \times .06 \div 12) \times 11.3 = \$70964 \text{ Ans.}$$

( 29 )

yr.	mo.	da.
1854	5	10
1850	10	5
3	7	5

$$\begin{aligned}
 & (745.40 \times .05 \div 12) \times 43.1\frac{2}{3} = \$134.06703 + ; \\
 & 134.06703 + 745.40 = \$879.46703 + \text{Ans.}
 \end{aligned}$$

( 30 )

$$\begin{aligned}
 & \text{1st time, 1 yr. 3 mo. 21 da.; 2d, 9 mo. 27 da.} \\
 & (250 \times .07 \div 12) \times 15.7 = \$22.89531 ; \\
 & 22.89531 + 250 = \$272.89531 ; \\
 & (500 \times .07 \div 12) \times 9.9 = \$28.87434 ; \\
 & 28.87434 + 500 = \$528.87434 ; \\
 & 272.895 + 528.874 = \$801.769 + \text{Ans.}
 \end{aligned}$$

( 31 )

From January 1st to September 1st	= 8 mo.
" " March 15th	" = 5 mo. 16 da.
" April 20th	" = 4 mo. 11 da.
" June 3d	" = 1 mo. 28 da.

Amount of \$254	for 8 mo.	= \$264.16
"	\$154.60 " 5 mo. 16 da.	= \$158.8772 +
"	\$424.25 " 4 mo. 11 da.	= \$433.5127 +
"	\$75.50 " 2 mo. 28 da.	= \$76.6073 +
		<u>\$933.1573 A.</u>

( 32 )

$$\$475.75 \times .07 \div 12 = 2.7752 ; 2.7752 \times 8.5 = \$499.339 \text{ A.}$$

(33)

$$\$127.28 \times .06 \div 12 = .6364; .6364 \times 21 + 127.68 = 140.644$$

(34)

At the end of the first year \$1500 must be paid, and the interest on \$4500, equal to. . . . \$1792.50

At the end of the second year \$1500, and interest on \$3000 . . . . = \$1695.00

At the end of the third year \$15000, and interest on \$1500 . . . . = \$1597.50

Amount, \$5085.00 A.

(35)

Interest on \$40 for 8 months	.	.	.	\$1.86 $\frac{2}{3}$
" " \$40 " 7 "	.	.	.	1.63 $\frac{1}{3}$
" " \$40 " 6 "	.	.	.	1.40
" " \$40 " 5 "	.	.	.	1.16 $\frac{2}{3}$
" " \$40 " 4 "	.	.	.	.93 $\frac{1}{3}$
" " \$40 " 3 "	.	.	.	.70
" " \$40 " 2 "	.	.	.	.46 $\frac{2}{3}$
" " \$40 " 1 "	.	.	.	.23 $\frac{1}{3}$

Interest due at end of time . . . . \$8.40

Add principal due . . . . 360.00

Amount due . . . . \$368.40

Interest on \$368.40 for 1 yr. 4 mo. 15 da. = \$35.458 ;

\$368.40 + 35.458 = \$403.858. Ans.

(36)

$$\$9000 \div 3 = \$3000 ;$$

Amount of \$3000 for 6 mo. at 7 $\frac{1}{2}$  per cent. = \$3112.50

" " \$3000 for 12 mo. at 7 $\frac{1}{2}$  " = \$3225

\$3000 + \$3112.50 + \$3225 = \$9337.50 Ans.

(1)

yr.	mo.	da.
1864	6	10, when due ;
1864	1	1, date.
<hr/>		
	5	9

$$(382.50 \times .07 \div 12) \times 5.3 = \$11.825625 ;$$

$$11.825625 + 382.50 = \$394.325625 \text{ Ans.}$$

(2)

yr.	mo.	da.
1864	7	4, when due ;
1862	3	1, when reckoned.
<hr/>		
	2	4 3

$$(612 \times .06 \div 12) \times 28.1 = \$85.986 ;$$

$$85.986 + 612 = \$697.986 \text{ Ans.}$$

(3)

The interest begins on January 1st, and continues 6 months after date, or to January 3d, 1861 = 1 yr. 0 mo. 2 da. ;

$$(3120 \times .07 \div 12) \times 12.0\frac{2}{3} = \$219.613\frac{1}{3} ;$$

$$219.613\frac{1}{3} + 3120 = \$3339.613\frac{1}{3} \text{ Ans.}$$

(4)

The note was due on July 7th, 1862 ;

yr.	mo.	da.
1862	7	7
1861	12	3
<hr/>		
	7	4

$$(786.50 \times .08 \div 12) \times 7.1\frac{1}{3} = \$37.4022+ ;$$

$$37.4022 + 786.50 = \$823.9022+ \text{ Ans.}$$

(5)

This note was on interest 3 months ;

$$\$4560.72 \times .07 \div 12 = 26.6042 ;$$

$$26.6042 \times 3 + 4560.72 = \$4640.532 \text{ Ans.}$$

(6)

This note is payable June 17, 1857, and bears interest  
1 yr. 1 mo. 4 da. ;

$$\$1854.83 \times .06 \div 12 = 9.27415 ;$$

$$9.27415 \times 13.1\frac{1}{3} + 1854.83 = 1976.630 \text{ Ans.}$$

(2)

$$£203 \text{ 18s. 6d.} = £203.925 ;$$

$$(203.925 \times .06 \div 12) \times 44.5\frac{1}{3} = 45.4073 ;$$

$$£45.4073 = £45 \text{ 8s. } 1\frac{3}{4}\text{d. Ans.}$$

(3)

$$£215 \text{ 13s. 8d.} = £215.68333 + ;$$

$$(215.68333 \times .06 \div 12) \times 42.3 = 45.617024 + ;$$

$$£45.617024 + = £45 \text{ 12s. 4d. 0.34 + far.}$$

(4)

$$£1543 \text{ 10s. 6d} = £1543.525 ;$$

$$(1543.525 \times .04 \div 12) \times 30 = £154.3525 ;$$

$$£154.3525 = £154 \text{ 7s. 0d. 2.4 far. Ans.}$$

(5)

$$£1047 \text{ 3s.} = £1047.15 ;$$

$$(1047.15 \times .06 \div 12) \times 16.5 = £86.38905 ;$$

$$86.38905 + £1047.15 = £1133.53905 = £1133 \text{ 10s. } 9\frac{1}{4}\text{d. A.}$$

(6)

$$\begin{aligned} \text{£}511 \text{ 1s. 4d.} &= \text{£}511.0666 + ; \text{£}511.0666 \times .06 \div 12 \times 78 = \\ &\text{£}199.3159 = \text{£}199 \text{ 6s. 3d. 3 far. } \textit{Ans.} \end{aligned}$$

(7)

$$\begin{aligned} \text{£}161.7625 \times .06 \div 12 &= .8088125 ; \\ .8088125 \times 8.4\frac{1}{2} &= \text{£}6.82098541 = \text{£}6 \text{ 16s. 5d. } \textit{Ans.} \end{aligned}$$

## PARTIAL PAYMENTS.

(2)

Principal on interest from Feb. 6, 1850, . . \$6478.84

Interest to May 16, 1853, time  
of first payment, 3 yr. 3 mo.

10 da. . . . . \$1274.17186

First payment is less than the interest: take the interest on principal, from May 16, 1853, to

May 16, 1855, 2 years . . 777.4608

The first two payments are less than the interest: take the interest on principal from May

16, 1855, to Feb. 1, 1856,

8 mo. 15 da. . . . . 275.3507

Interest due, \$2326.98336

Amount, \$8805.8236

Since the three payments exceed the interest,  
we deduct the three payments . . . .3896.48

Sum due, Feb. 1, 1856, \$4909.3433

Interest on \$4909.3433 from Feb. 1, 1856,  
to Aug. 11, 1857, 1 yr. 6 mo. 10 da. . .450.0231

Amount due, Aug. 11, 1857, \$5359.3664

(3)

Principal on interest from Sept. 5, 1851 . . \$7851.04

Interest on principal, to Nov. 13,

1853 (2 yr. 2 mo. 8 da.) . . . \$1031.10325

The first payment being less than  
interest, find the interest from

Nov. 13, 1853, to May 10, 1854

(5 mo. 27 da.) . . . . . 231.60568

The second payment being less than  
interest, find the interest from

May 10, 1854, to March 1,

1855 (9 mo. 21 da.) . . . 380.77544

Interest due, 1643.48437

Amount, \$9494.52437

Sum of payments, 568.98

Remainder due, March 1, 1855, \$8925.54437

*Answer.*

(4)

Principal on interest from Jan. 3, 1854 . . \$8974.56

Interest to Feb. 16, 1855 (1 yr. 1 mo. 13 da.) . 703.256

Amount, \$9677.816

Payment Feb. 16, 1855 . . . . . 1875.40

Remainder for new principal, Feb. 16, 1855 . \$7802.416

Interest to Sept. 15, 1856 (1 yr. 6 mo. 29 da.) 863.249

Amount, \$8665.665

Payment Sept. 15, 1856 . . . . . 3841.26

Remainder for new principal, Sept. 15, 1856 . \$4824.405

Interest to Nov. 11, 1857 (1 yr. 1 mo. 26 da.) 390.240

Amount, \$5214.646



	Amount,	\$5214.646
Payment, Nov. 11, 1857 . . . . .		<u>1809.10</u>
Remainder for new principal, Nov. 11, 1857 .		\$3405.546
Interest to June 9, 1858 (6 mo. 28 da.) . .		<u>137.735</u>
	Amount,	\$3543.281
Payment June 9, 1858 . . . . .		<u>2421.04</u>
Remainder for new principal, June 9, 1858 .		\$1122.241
Interest to July 1, 1858 (22 da.) . . . .		<u>4.800</u>
Amount due, July 1, 1855,		\$1127.041

*Answer.*

( 5 )

Principal on interest, from Nov. 1, 1852 . .	\$345.50
Interest to June 20, 1853 (7 mo. 19 da) . .	<u>15.384</u>
	Amount, \$360.884
Payment June 20, 1853 . . . . .	<u>75.000</u>
Remainder for new principal, June 20, 1853 .	\$285.884
Interest to Dec. 13, 1856 (3 yr. 5 mo. 23 da.) .	<u>69.652</u>
	Amount, \$355.536
Payment, Jan. 12, 1854 . . . . .	\$10.00
Payment March 3, 1855 . . . . .	15.50
Payment Dec. 13, 1856 . . . . .	<u>52.75</u>
	Their sum, \$78.25
Remainder for a new principal, Dec. 13, 1856 .	\$277.286
Interest to Oct. 14, 1857 (10 mo. 1 da.) . .	<u>16.228</u>
	Amount, \$293.514
Payment Oct. 14, 1857 . . . . .	<u>106.75</u>
Remainder for new principal, Oct. 14, 1857, .	\$186.764
Interest to Feb. 4, 1858 (3 mo. 20 da.) . .	<u>3.994</u>
Amount due, Feb. 4, 1858 .	\$190.758 A.

( 6 )		
Principal on interest, from Oct. 19, 1850 . .	\$450.00	
Interest to Sept. 25, 1851 (11 mo. 6 da.) . .	<u>33.60</u>	
Amount,	\$483.60	
Payment Sept. 25, 1851 . . . . .	<u>85.60</u>	
Remainder for new principal, Sept. 25, 1851 .	\$398.00	
Interest to June 6, 1853 (1 yr. 8 mo. 11 da.) .	<u>54.039</u>	
Amount,	\$452.039	
Payment July 10, 1852 . . . . .	\$20.00	
Payment June 6th, 1853 . . . . .	<u>150.45</u>	
Their sum,	\$170.45	
Remainder for new principal, June 6, 1853. .	\$281.589	
Interest to May 5, 1855 (1 yr. 10 mo. 2 da.) .	<u>43.114</u>	
Amount,	\$324.703	
Payment Dec. 28, 1854 . . . . .	\$25.125	
Payment May 5, 1855 . . . . .	<u>169.000</u>	
Their sum,	\$194.125	
Remainder for new principal, May 5, 1855 .	\$130.578	
Interest to Oct. 18, 1857 (2 yr. 5 mo. 13 da.) .	<u>25.622</u>	
Amount due, Oct. 18, 1857,	\$156.200	A.

## PROBLEMS IN SIMPLE INTEREST.

( 2 )

$$9 \text{ mo.} = \frac{3}{4} \text{ yr.} = .75 \text{ yr. ;}$$

$$P = \frac{178.9552}{.06 \times .75} = \$3976.7822 + \text{Ans.}$$

( 3 )

$$P = \frac{76.965}{.07 \times 2.5} = \$439.80 \text{ Ans.}$$

(4)

10 mo. 15 da. =  $\frac{7}{8}$  yr. = .875 yr.

$$P = \frac{327.3249}{.06 \times .875} = \$6234.76 \text{ Ans.}$$

(5)

$$P = \frac{1500}{.05 \times 1} = \$30000 \text{ Ans.}$$

(6)

4 yr. 3 mo. = 4.25 yr. ;

$$P = \frac{283.3914}{.07 \times 4.25} = \$952.5761 + \text{ Ans.}$$

(7)

3 yr. 1 mo. 18 da. =  $3.13\frac{1}{3}$  yr. ;

$$R = \frac{460.60}{2100 \times 3.13\frac{1}{3}} = .07 = 7\% \text{ Ans.}$$

(8)

1 yr. 10 mo. =  $1.83\frac{1}{3}$  yr. ;

$$R = \frac{452.98}{2470.80 \times 1.83\frac{1}{3}} = .10 = 10\% \text{ Ans.}$$

(9)

2 yr. 7 mo. 24 da. = 2.65 yr. ;

$$R = \frac{\begin{array}{r} 15.741 \\ \cancel{62.964} \\ 503.712 \end{array}}{\begin{array}{r} \cancel{3456} \times 2.64 \\ \cancel{432} \\ 108 \end{array}} = .05\frac{1}{2} = 5\frac{1}{2}\% \text{ Ans.}$$

(10)

$$R = \frac{7000}{\frac{56000}{8} \times 1} = .12\frac{1}{2}, \text{ or } 12\frac{1}{2}\% \text{ Ans.}$$

(11)

$$T = \frac{\frac{2798.7}{195.909}}{1119.48 \times \frac{.07}{1}} = 2\frac{1}{2} \text{ yr.} = 2 \text{ yr. } 6 \text{ mo. } \text{Ans.}$$

(12)

The interest is \$500 ;

$$T = \frac{\frac{1}{500}}{500 \times .06} = 16\frac{2}{3} \text{ yr.} = 16 \text{ yr. } 8 \text{ mo. } \text{Ans.}$$

(13)

$$5009.60 - 3720 = \$1289.60 = \text{interest ;}$$

$$T = \frac{1289.60}{3720 \times .06\frac{1}{2}} = 5\frac{1}{2} \text{ yr.} = 5 \text{ yr. } 4 \text{ mo. } \text{Ans.}$$

(14)

He must keep it until the interest of \$750, at 6 %, shall equal the interest of \$700, at 6%, for 1 yr. 8 mo. ;

$$(700 \times .06 \div 12) \times 20 = \$70, \text{ interest of } \$700 ;$$

$$T = \frac{70}{750 \times .06} = 1\frac{3}{5} \text{ yr.} = 1 \text{ yr. } 6 \text{ mo. } 20 \text{ da. } \text{Ans.}$$

(15)

$$P = \frac{450}{.06 \times 1} = \$7500 \text{ Ans.}$$

## COMPOUND INTEREST.

(2)

$$\begin{aligned}
 175 \times .07 + 175 &= \$187.25 ; \\
 187.25 \times .07 + 187.25 &= \$200.3575 ; \\
 \$200.3575 - \$175 &= \$25.3575 \text{ Ans.}
 \end{aligned}$$

(3)

$$\begin{aligned}
 240 \times .05 + 240 &= \$252 ; \\
 252 \times .05 + 252 &= \$264.60 ; \\
 264.60 \times .05 + 264.60 &= \$277.83 ; \\
 277.83 \times .05 + 277.83 &= \$291.7215 \text{ Ans.}
 \end{aligned}$$

(4)

$$\begin{aligned}
 300 \times .06 + 300 &= \$318 ; \\
 318 \times .06 + 318 &= \$337.08 ; \\
 337.08 \times .06 + 337.08 &= \$357.3048 ; \\
 357.3048 - 300 &= \$57.3048 \text{ Ans.}
 \end{aligned}$$

(5)

$$\begin{aligned}
 590.74 \times .06 + 590.74 &= \$626.1844 ; \\
 626.1844 \times .06 + 626.1844 &= 663.7554 ; \\
 663.7554 - 590.74 &= \$73.015 \text{ Ans.}
 \end{aligned}$$

To multiply the principal by the rate, and to add the principal to the product, is equivalent to multiplying the principal by 1 + the rate ; hence,

(6)

$$500 \times 1. \quad \times 1.08 = \$583.20 ; 583.20 - 500 = \$83.20 \text{ A.}$$

(7)

$$\begin{aligned}
 3758.56 \times 1.07 \times 1.07 \times 1.07 &= \$4604.3976 ; \\
 4604.3976 - 3758.56 &= \$845.8376 + \text{Ans.}
 \end{aligned}$$

(8)

$$95637.50 \times 1.06 \times 1.06 \times 1.06 \times 1.06 \times 1.06 \times 1.06 \times 1.06 \times 1.06 = \$143803.4388 + 143803.4388 - 95637.50 = \$18165.9388 + \text{Ans.}$$

(9)

$$\begin{array}{r}
 75439.75 \\
 \underline{.04\frac{1}{2}} \\
 377\ 19875 \\
 3017\ 5900 \\
 \hline
 3394.78875 \text{ interest of first year.} \\
 75439.75 \\
 \hline
 78834.53875 \text{ amount of first year.} \\
 \underline{.04\frac{1}{2}} \\
 394\ 1726937\frac{1}{2} \\
 3153\ 3815500 \\
 \hline
 3547.5542437\frac{1}{2} \text{ interest of second year.} \\
 78834.53875 \\
 \hline
 82382.09299 \text{ amount of second year.} \\
 \underline{.04\frac{1}{2}} \\
 411\ 9104649\frac{1}{2} \\
 3295\ 2837196 \\
 \hline
 3707.1941845 \text{ interest of third year.} \\
 82382.09299 \\
 \hline
 86089.28717 \text{ amount of third year.} \\
 \underline{.04\frac{1}{2}} \\
 430\ 4464358\frac{1}{2} \\
 3443\ 5714868 \\
 \hline
 3874.0179226 \text{ interest of fourth year.} \\
 86089.28717 \\
 \hline
 89963.30509 \text{ amount of fourth year.} \\
 75439.75 \\
 \hline
 14523.55509 \text{ compound interest for four years. } A
 \end{array}$$

## DISCOUNT.

(1)

\$1.09 $\frac{1}{2}$ , amount of \$1 for 1 year 4 months ;

$$615 \div 1.09\frac{1}{2} = \$562.50 \text{ Ans.}$$

(2)

\$1.098, amt. of \$1 for 1 yr. 7 mo. 18 da.;

$$202.58 \div 1.098 = \$184.499+ \text{ Ans.}$$

(3)

\$1.03, amt. of \$1 for 7 mo. 6 da. ;

$$721 \div 1.03 = \$700 = \text{present worth ;}$$

$$721 - 700 = \$21 = \text{discount. Ans.}$$

(4)

Time, 4 mo. 24 da.;

\$1.032, amt. of \$1 for 4 mo. 24 da. ;

$$5160 \div 1.032 = \$5000 \text{ Ans.}$$

(5)

\$1.314, amt. of \$1 for 2 yr. 7 mo. 12 da. ;

$$2500 \div 1.314 = \$1902.587+ \text{ Ans.}$$

(6)

1.085 $\frac{5}{8}$ , amt. of \$1 for 1 yr. 2 mo. 20 da. ;

$$3000 \div 1.085\frac{5}{8} = 2763.562+, \text{ present value ;}$$

$$3000 - 2763.562 = \$236.438, \text{ discount. Ans.}$$

(7)

Time, 2 mo. 16 da. ;

\$1.014 $\frac{2}{3}$ , amt. of \$1 for 2 mo. 16 da. ; $1400 \div 1.014\frac{2}{3} = \$1379.6123 +$  Ans.

(8)

 $10.50 \times 300 = \$3150$ , cost ; $12 \times 300 = \$3600$ , price on 3 mo. credit ; $3600 \div 1.0175 = \$3538.0835$ , cash value ; $3538.0835 - 3150 = \$388.0835 +$ , gain.

(9)

Cash = \$5000.00000

\$1.015, amt. of \$1 for 3 mo. ;  $2500 \div 1.015 = \$2463.05418 +$ \$1.03, amt. of \$1 for 6 mo. ;  $2500 \div 1.03 = \$2427.18446 +$ 

Cash value, \$9890.23864 +

(10)

\$1.02, amt. of \$1 for 4 mo. ;  $.075 \div 1.02 = \$0.07352$ , present value at 3 mo. ;\$1.03, amt. of \$1 for 6 mo. ;  $.08 \div 1.03 = \$0.07766$ , present value at 6 mo. ; $0.07766 - 0.07352 = 0.00414$ .Most advantageous to buy at  $7\frac{1}{2}$  cents per pound. Ans.

(11)

 $10 \times .20 = \$2.00$ , gain ;  $10 + 2 = \$12$ , price at which it was sold ; $1 - .10 = 90$  ; the selling price was 90% of the asking price ; hence, $12 \div 90.90 = \$13.333\frac{1}{3}$  Ans.



(12)

Time of discount and interest of first note is 1 mo.; of the second, 3 mo. 9 da.; of the third, 4 mo.

	mo.	da.	
\$1.005, amt. of \$1 for 1			$1000 \div 1.005 = \$995.0248 +$
\$1.0165, " \$1 " 3 9;	3	9	$500 \div 1.0165 = \$491.8839 +$
\$1.02, " \$1 " 4;	4		$900 \div 1.02 = \$882.3529 +$

Cash value of 3 notes on July 1, \$2369.2617 +

The amount of \$1000 for 1 mo. at 6%. . . \$1005

" " of \$500 " 3 mo. 9 da. at 6% . . . 508.25

" " of \$900 " 4 mo. at 6% . . . 918.00

Value of 3 notes when due, \$2431.25

2369.2617

Difference, \$61.9883

## BANK DISCOUNT.

(1)

Time, 4 mo. 3 da. = 4.1 mo.;  $(300 \times .06 \div 12) \times 4.1 = \$6.15$

(2)

$(200 \times .09 \div 12) \times 5.1 = \$7.65$  Ans.

(3)

$(500 \times .065 \div 12) \times 8.6 = \$23.2913 + \text{dis.};$

$500 - 23.2916 = \$476.7084 + \text{cash value.}$

(4)

$(1255.38 \times .07 \div 12) \times 4.1 = \$30.0245 + \text{dis.};$

$1255.38 - 30.0245 = \$1225.3555 + \text{Ans.}$

(5)

Time, 1 mo. 15 da. = 1.5 mo.;

$(500 \times .07 \times 12) \times 1.5 = \$4.375.$  Ans.

(6)

$$4368 \times 1.25 = \$5460, \text{ cost of the wheat;}$$

$$4368 \times 1.30 = \$5678.40, \text{ sold it for;}$$

$$5678.40 \times .07 \div 12 = \$33.124;$$

$$33.124 \times 4.1 = \$135.8084 + \text{dis.};$$

$$5678.40 - 135.8084 = \$5542.5916;$$

$$5542.5916 - 5460 = 82.5916, \text{ gain.}$$

(7)

$$(7000 \times .06 \div 12) \times 7.1 = \$248.50, \text{ bank discount;}$$

$$\$1.035, \text{ amount of \$1 for 7 months;}$$

$$7000 \div 1.035 = \$6763.285 +, \text{ present value;}$$

$$7000 - 6763.285 = \$236.715, \text{ true discount;}$$

$$248.50 - 236.715 = \$11.785, \text{ difference. Ans.}$$

(8)

$$(10000 \times .08 \div 12) \times 4.6 = \$306.66\frac{2}{3}, \text{ bank discount;}$$

$$10000 \div 1.03 = \$9708.7378 +, \text{ present value;}$$

$$10000 - 9708.7378 = \$291.2622 +, \text{ true discount;}$$

$$306.6666 - 291.2622 = \$15.4044 +, \text{ difference. Ans.}$$

(9)

$$\text{Time, 4 mo. 3 da.} = 4.1 \text{ mo.};$$

$$(1000 \times .05\frac{1}{2} \div 12) \times 4.1 = \$18.7916 +, \text{ discount;}$$

$$1000 - 18.7916 = \$981.2083 +, \text{ or } 981.21 \text{ Ans.}$$

(10)

When A turns in the note at the bank, it will have 4 months and 3 days to run; therefore, they will take discount on \$1500 for 4 months and 3 days, which will be \$25.625; \$1000 + \$25.625 = \$1025.625 taken from \$1500 leaves \$474.375 what A received back.

(2)

 $(1 \times .07 \div 12) \times 6.1 = \$0.0355\frac{5}{8}$ , discount of \$1 ; $1 - .0355\frac{5}{8} = \$0.9644\frac{1}{8}$ , present value of \$1 ; $285.95 \div .9644\frac{1}{8} = \$296.50$  *Ans.*

(3)

\$0.968, present value of \$1 for 6 mo. 12 da. ;

 $674.89 \div .968 = \$697.20$  *Ans.*

(4)

\$0.96, present value of \$1 for 9 mo. 18 da. ;

 $1000 \div .96 = \$1041.66\frac{2}{3}$  *Ans.*

(5)

 $9.125 \times 380 = \$3467.50$ , cost of the flour ;

.9845, present value of \$1 for 3 mo. 3 da., at 6 per cent ;

 $3467.50 \div .9845 = \$3522.092$ , face of the note.

## STOCKS.

(2)

\$100 per share ;  $100 \times 43 = \$4300$ , value of 43 shares ; $4\frac{1}{2}\%$  semi-annually gives 9% annually, or  $.04\frac{1}{2} \times 2 = .09$  ;hence,  $100 \times 43 \times .04\frac{1}{2} \times 2 = \$387.00$  *Ans.*

(3)

 $100 \times 18 \times .05 = \$90.00$  *Ans.*

(4)

 $5416 \times .47\frac{1}{4} = \$2559.06$ , A's ;  $6795 \times .47\frac{1}{4} = \$3210.6375$ , B's.

(5)

 $25 \times 36 \times .17 = \$153.00$  *Ans.*

(2)

$100 \times 56 = \$5600$ , cost at par; as discount diminishes and brokerage increases the cost, the discount may be considered equal to  $.05\frac{1}{2} - .00\frac{1}{2} = .05$ ;

$5600 \times .05 = \$280$ ;  $5600 - 280 = \$5320$ , cost or market value.

(3)

$1.2\frac{1}{2} - .00\frac{1}{2} = .12$  = discount less brokerage;

$100 \times 36 \times .12 = \$432$ ;  $3600 - 432 = \$3168$ , cost;

$100 \times 36 \times .07 = \$252$ , premium;

$3600 + 252 = \$3852$ , selling price;

$100 \times 36 \times .00\frac{1}{2} = \$18$ , brokerage;

$3852 - 3168 = \$684$ , total gain;  $684 - 18 = \$666$ , net gain.

(4)

$75 \times 216 \times .07\frac{3}{4} = \$1255.50$ ;

$75 \times 216 + 1255.50 = \$17455.50$  *Ans.*

(5)

$200 \times 257 \times .15 = \$7710$ ;  $200 \times 257 + 7710 = \$59110.00$

(6)

$150 \times 120 \times .18\frac{3}{4} = \$3375$ ;  $150 \times 120 + 3375 = \$21375$

(7)

$125 \times 69 \times .07\frac{1}{4} = \$625.3125$ ;

$125 \times 69 - 625.3125 = \$7999.6875$  *Ans.*

(8)

$1000 \times 200 \times .06\frac{3}{4} = \$13500$ ;

$1000 \times 200 + 13500 = \$213500$  *Ans.*

(9)

$20 \times 125 = \$2500$ , par val.;  $2500 \times .05 = \$125 = 1\text{st div.}$ ;  
 $2500 \times .04 = \$100 = 2\text{d div.}$ ;  $2500 \times .10 = \$250$ , premium;  
 $(125 \times .07 \div 12) \times 8 = \$5.83\frac{1}{3}$ , int. on 1st div. for 8 mo.;  
 $(100 \times .07 \div 12) \times 2 = \$1.16\frac{2}{3}$ , " 2d " 2 mo.;  
 $125 + 100 + 250 + 5.83\frac{1}{3} + 1.16\frac{2}{3} = \$482$ , income of \$2500;  
 $(2500 \times .07 \div 12) \times 12 = \$175$ , interest of \$2500 to be de-  
 ducted;  $482 - 175 = \$307$ , net profit. *Ans.*

(2)

$$\frac{\text{Difference}}{1 - \text{Rate}} = \frac{3000}{.85} = \$3529.411 + \text{Ans.}$$

(3)

$$\frac{6384}{1.14} = \$5600 \text{ par value; } 5600 \div 100 = 56 \text{ shares. } \text{Ans.}$$

(4)

$$\frac{3700}{.925} = \$4000 \text{ Ans.}$$

(5)

$$\frac{7000}{.9675} = \$7235.142 + \text{Ans.}$$

(6)

$$\frac{8700}{1.0875} = \$8000 \text{ A.}$$

(7)

$$\begin{aligned}
 12000 \times .03\frac{1}{2} &= \$420, \text{ discount;} \\
 12000 - 420 &= \$11580, \text{ market val.;} \\
 11580 \div 1.11 &= \$10432.432 + \text{Ans.}
 \end{aligned}$$

(2)

$$\begin{aligned}
 1 - 12\frac{1}{2} &= \$.87\frac{1}{2}, \text{ market value of } \$1; \\
 1 \times .07 &= \$0.07, \text{ interest of } \$1 \text{ for 1 year;} \\
 .07 \div .875 &= .08, \text{ or } 8\% \text{ Ans.}
 \end{aligned}$$

(3)

$$\begin{aligned}
 .02\frac{1}{2} \times 2 &= .05, \text{ annual dividend;} \\
 .05 \div .625 &= .08, \text{ or } 8\% \text{ Ans.}
 \end{aligned}$$

(4)

$$.07 \div .875 = .08, \text{ or } 8\% \text{ Ans.}$$

(5)

$$.06 \div 1.20 = .05, \text{ or } 5\%$$

(2)

$$1 \times .08 = \$0.08, \text{ interest of } \$1; .08 \div .10 = .80, \text{ market value of } \$1, \text{ or } 80\% \text{ of par value; } 1 - .80 = .20, \text{ or } 20\% \text{ dis.}$$

(3)

$$.07 \div .12 = .58\frac{1}{3}; 1 - .58\frac{1}{3} = .41\frac{2}{3}, \text{ or } 41\frac{2}{3}\% \text{ Ans.}$$

(4)

$$.09 \div .08 = 1.12\frac{1}{2}; 1.12\frac{1}{2} - 1 = .12\frac{1}{2}, \text{ or } 12\frac{1}{2}\% \text{ premium A.}$$

(2)

$$\frac{1 \times .06}{1} = .06 = 6\%; \frac{1 \times .07}{1.07} = .0654 + = 6\frac{54}{100}\%; 7\% \text{ best.}$$

(3)

$$\frac{1 \times .08}{1.20} = .06\frac{2}{3} = 6\frac{2}{3}\%; \frac{1 \times .05}{.80} = .06\frac{1}{4} = 6\frac{1}{4}\%; 8\% \text{ best.}$$

(4)

$$\begin{aligned} \$1 \times .05 \div 1.00 &= .05 \text{ rate of profit of the 5 per cent.;} \\ \$1 \times .06 \div .90 &= .06\frac{2}{3} \text{ rate of profit of the 6 per cent.;} \\ 2000 \times .05 \times 5 &= \$500 \text{ profit for 5 yr. of the 5 per cent.;} \\ 2000 \times .06\frac{2}{3} \times 5 &= \$666.66\frac{2}{3} \text{ for 5 yr. of the 6 per cent.;} \\ \$666.66\frac{2}{3} - 500 &= \$166.66\frac{2}{3} \text{ difference of proceeds.} \end{aligned}$$

## INSURANCE.

(1)

$$147674 \times .03\frac{1}{2} = \$5168.59 \text{ Ans.}$$

(2)

$$47520 \times .005 = \$237.60; 47520 \times .00\frac{1}{3} = \$158.40 \text{ Ans.}$$

(3)

$$16800 \times .01\frac{1}{2} = \$252; 16800 \times .00\frac{3}{4} = \$126.00 \text{ Ans.}$$

(4)

$$\frac{2}{3} \text{ of } \frac{3}{4} \text{ of } 24000 = \$12000; 12000 \times 02\frac{1}{2} = \$300 \text{ Ans.}$$

(5)

$$5640 \times .00\frac{3}{4} = \$42.30; 75600 \times 00\frac{5}{8} = 47.25;$$

$$42.30 + 47.25 = \$89.55 \text{ Ans.}$$

(6)

$$75 \text{ cents per } 100 = \frac{3}{4} \text{ of } \$1 \text{ per } \$100 = \frac{3}{4}\%;$$

$$425 \times 15 \times .00\frac{3}{4} = \$47.8125 \text{ Ans.}$$

(7)

$$150 \times 63 \times .35 = \$3307.50, \text{ first cost};$$

$$150 \times 63 \times .50 = \$4725, \text{ selling price};$$

$$4725 \times .035 = \$165.375, \text{ insurance};$$

$$3307.50 + 165.375 = \$3472.875, \text{ whole cost};$$

$$4725 - 3472.875 = \$1252.125, \text{ gain Ans.}$$

(8)

$$3640 \times .04\frac{1}{2} = \$163.80 \text{ insurance} = \text{loss in case of destruction.}$$

(9)

$$12000 \times .0275 = \$330; 18500 \times .0325 = \$601.25;$$

$$330 + 601.25 = \$931.25; 20450 + 25600 + 931.25 = \$46981.25;$$

$$12000 + 18500 = \$30500; 46981.25 - 30500 = \$16481.25,$$

$$\text{total loss. Ans.}$$

(10)

$$5000 \times 10.50 = \$52500, \text{ value of the flour};$$

$$2887.50 \div 52500 = .05\frac{1}{2}, \text{ or } 5\frac{1}{2} \text{ per cent. for insurance.}$$

(11)

$$120 \div 7500 = .01\frac{2}{3}, \text{ or } 1\frac{2}{3} \text{ per cent. } Ans.$$

(12)

$$225 \times 40 \times 3.50 = \$31500, \text{ cost of cloth ;}$$

$$\$1323 \div 31500 = .04\frac{1}{5}, \text{ or } 4\frac{1}{5}\% \text{ for insurance. } Ans.$$

(13)

$$1320 \div .055 = \$24000. \text{ } Ans.$$

(14)

$$51 \div .015 = \$3400, \text{ value of storehouse ; } 126.45 \div .0225 \\ = \underline{\$5620}, \text{ " " contents ;}$$

$$\$9020, \text{ whole value of property insured.}$$

(15)

$$275 \times 15 = \$4125, \text{ value of pianos ; } \$4125 \times .03 = \$123.75, \\ \text{premium ; } 123.75 \times .03 = \$3.7125, \text{ insurance on premium ;} \\ 123.75 + 3.7125 = 127.4625, \text{ amount of insurance.}$$

(16)

$$16750 \times .0175 = \$293.125, \text{ premium ;}$$

$$293.125 \times .0175 = \$5.1296, \text{ amount of premium ;}$$

$$293.125 + 5.1296 = \$298.2546, \text{ amount of insurance.}$$

## LIFE INSURANCE.

(1)

$$8950 \times 1.36 \div 100 = \$121.72$$

(2)

$$12500 \times 1.86 \div 100 = \$232.50$$

(3)

$$15000 \times 1.75 \div 100 = \$262.50$$

(4)

$$5000 \times .004 = \$20 \text{ } Ans.$$



(5)

$$2000 \times 4.91 \div 100 = \$98.20 \text{ Ans.}$$

(6)

$$1500 \times .04\frac{3}{4} \times 20 = \$1380; 1500 - 1380 = \$120.00 \text{ Ans.}$$

(7)

$$\begin{aligned} 10000 \times 2.71 \div 100 &= \$271, \text{ annual premium;} \\ \$271, &\text{ premium paid at the beginning of the 1st year;} \\ 47.425, &\text{ interest on \$271, 2 years 6 months;} \\ 271, &\text{ premium paid at the beginning of the 2d year;} \\ 28.455, &\text{ interest on \$271, 1 year 6 months;} \\ 271, &\text{ premium paid at the beginning of the 3d year;} \\ 9.485, &\text{ interest on \$271, 0 year 6 months;} \\ \$898.365, &\text{ premiums and interest;} \\ 10000 - 898.365 &= \$9101.635 \text{ Ans.} \end{aligned}$$

## ENDOWMENTS.

(1)

$$\begin{aligned} 100 : 250 :: 164.46 : x &= 411.15; \\ \frac{250 \times 164.46}{100} &= \$411.15 \text{ Ans.} \end{aligned}$$

(2)

$$\begin{aligned} 100 : 360 :: 210.53 : x &= 757.908; \\ \frac{360 \times 210.53}{100} &= \$757.908 \text{ Ans.} \end{aligned}$$

(3)

$$\begin{aligned} 100 : 650 :: 188.83 : x &= 1227.395; \\ \frac{650 \times 188.83}{100} &= \$1227.395 \text{ Ans.} \end{aligned}$$

## ANNUITIES.

(1)

$$12.821153 \times 550 = \$7051.63415 \text{ Ans.}$$

(2)

$$10.83777 \times 835 = \$9049.53795 \text{ Ans.}$$

(3)

$$15.372451 \times 1500 = \$23058.6765 \text{ Ans.}$$

(4)

$$27560 \div 12.550358 = \$2195.95 \text{ Ans.}$$

(5)

$$25000 \div 11.469921 = \$2179.63; 217963 - 20 = \$2159.613$$

## ASSESSING TAXES.

(1)

$$1465.50 + 350.25 + 200.25 = 2016, \text{ tax to be raised;}$$

$$1.50 \times 350 = \$525, \text{ poll tax; } 2016 - 525 = \$1491, \text{ tax on property; } 1491 \div 318200 = .0046 = \frac{23}{50}\% \text{ Ans.}$$

(2)

$$98415 \times .25 = \$24603.75; 100406 - 24603.75 = \$75802.25;$$

$$75802.25 \div .002 = 37901125 \text{ Ans.}$$

(3)

$$56450 \times 25 = \$14112.50, \text{ poll tax; } 87467 - 14112.50 =$$

$$\$73354.50; 73354.50 \div 4890300 = .015 = 1\frac{1}{2} \text{ per cent;}$$

$$5400 \times .015 = \$81; 81 + (.25 \times 5 = 1.25) = \$82.25. A.$$

$$3760.50 \times .015 = \$56.4075; 56.4075 + .50 = \$56.9075 A.$$

(4)

$$40 \times .50 = \$20; 957.50 - 20 = \$937.50;$$

$$937.50 \div 125000 = .0075 = \frac{3}{4} \text{ per cent. } \textit{Ans.}$$

$$2000 \times .0075 = \$15; 15 + .50 = \$15.50 \textit{ Ans.}$$

(5)

$$674.50 \div .975 = \$5820.$$

(6)

$$21346.75 \div .96 = \$22236.197$$

(7)

$$4423.2475 \div .95 = \$4656.05, \text{ whole tax to be raised;}$$

$$150 \times .50 = \$75 \text{ poll tax; } 4656.05 - 75 = \$4581.05 \text{ to be}$$

$$\text{raised on taxable property;}$$

$$4581.05 \div 916210 = .005, \text{ or } \frac{1}{2} \text{ per cent. } \textit{Ans.}$$

$$2100 + 3000 = 5100; 5100 \times .005 = \$25.50;$$

$$25.50 + 1.50 = \$27 \textit{ Ans.}$$

$$1275.50 \times .005 = \$6.3775; 6.3775 + .50 = \$6.8775, \text{ G's tax.}$$

$$2456 \times .005 = \$12.28; 12.28 + .50 = \$12.78, \text{ H's tax.}$$

(8)

$$2850 \div 190000 = .015, \text{ or } 1\frac{1}{2}\% = 1\frac{1}{2} \text{ cents on } \$1 \textit{ Ans.}$$

$$7500 \times .015 = \$112.50 \textit{ Ans.}$$

$$1200 \times .015 = \$18 \textit{ Ans.}$$

(9)

$$60 \times 6 = \$360; 360 + 66 = \$426; 426 - 41.60 = \$384.40;$$

$$384.40 \div 76.88 = .05, \text{ tax per day; } 148 \times .05 = \$7.40 \textit{ Ans.}$$

$$184\frac{1}{2} \times .05 = \$9.225 \textit{ Ans.}$$

## EQUATION OF PAYMENTS.

(1)

$$\begin{array}{rcl}
 200 \times 4 & = & 800 \\
 400 \times 10 & = & 4000 \\
 600 \times 16 & = & 9600 \\
 \hline
 1200 & & 14400 \\
 14400 \div 1200 & = & 12 \text{ mo. } \textit{Ans.}
 \end{array}$$

(2)

$$\begin{array}{rcl}
 \frac{1}{3} \text{ of } 2400 & = & 800 \times 6 = 4800 \\
 \frac{1}{4} \text{ " } & = & 600 \times 8 = 4800 \\
 \frac{5}{12} \text{ " } & = & 1000 \times 12 = 12000 \\
 & & \underline{2400} \qquad \underline{21600}
 \end{array}$$

$$21600 \div 2400 = 9 \text{ mo. } \textit{Ans.}$$

(3)

$$\begin{array}{rcl}
 (\frac{1}{6} \text{ of } 4500) & = & 750 \times 4 = 3000 \\
 (\frac{1}{3} \text{ " } & = & 1500 \times 6 = 9000 \\
 (\frac{1}{2} \text{ " } & = & 2250 \times 12 = 27000 \\
 & & \underline{4500} \qquad \underline{39000}
 \end{array}$$

$$39000 \div 4500 = 8\frac{2}{3} \text{ mo. } \textit{A.}$$

(4)

$$\begin{array}{rcl}
 240 \times 3 & = & 720 \\
 360 \times 5 & = & 1800 \\
 600 \times 10 & = & 6000 \\
 & & \underline{1200} \qquad \underline{8520}
 \end{array}$$

$$8520 \div 1200 = 7\frac{1}{10} \text{ mo.} = 7 \text{ mo. } 3 \text{ da.}$$

(5)

$$\begin{array}{rcl}
 960 \times 0 & = & 000 \\
 960 \times 6 & = & 5760 \\
 960 \times 7 & = & 6720 \\
 960 \times 12 & = & 11520 \\
 \underline{3840} & & \underline{24000}
 \end{array}$$

$$24000 \div 3840 = 6\frac{1}{4} \text{ mo. } \textit{Ans.}$$

(6)

$$\begin{array}{rcl}
 1000 \times 0 & = & 0000 \\
 1200 \times 3 & = & 3600 \\
 800 \times 8 & = & 6400 \\
 1500 \times 10 & = & 15000 \\
 500 \times 12 & = & 6000 \\
 \underline{5000} & & \underline{31000}
 \end{array}$$

$$31000 \div 5000 = 6\frac{1}{5} \text{ mo.} = 6 \text{ mo. } 6 \text{ da.}$$

(7)

$$\begin{array}{rcl}
 200 \times 0 & = & 000 \\
 150 \times 31 & = & 4650 \\
 250 \times 45 & = & 11250 \\
 \underline{600} & & \underline{15900}
 \end{array}$$

$$15900 \div 600 = 26\frac{1}{2} \text{ days from July 1 ; or, July 28. } \textit{Ans.}$$

(2)

Bought April 1	..	\$4350	$\times 0$	=	0000
" May 7	..	3750	$\times 36$	=	135000
" June 5	..	2550	$\times 65$	=	165750
					<u>10650</u>
					<u>300750</u>

$300750 \div 10650 = 28\frac{51}{113}$  da. from April 1, or, April 29, the equated time of purchase ; 8 months after which, or, Dec. 29, is the equated time of payment.

(3)

May 1	3 mo. ..	Due Aug. 1	..	\$800	$\times 0$	=	00000
June 1	3 mo. ..	" Sept. 1	..	700	$\times 31$	=	21700
" 15	4 mo. ..	" Oct. 15	..	900	$\times 75$	=	67500
July 25	6 mo. ..	" Jan. 25	..	1000	$\times 177$	=	177000
					<u>3400</u>		<u>266200</u>

Due in 78 days from Aug. 1 ; or, October 18. *Ans.*  $78\frac{5}{7}$  da.

(4)

Jan. 1	4 mo. ..	Due May 1	..	367.20	$\times 3$	=	1101.60
" 28	3 mo. ..	" Apr. 28	..	901.80	$\times 0$	=	0000.00
Feb. 24	5 mo. ..	" July 24	..	826.38	$\times 87$	=	71895.06
Mar. 30	6 mo. ..	" Sept. 30	..	854.88	$\times 155$	=	132506.40
May 1	4 mo. ..	" " 1	..	396.50	$\times 126$	=	49959.00
					<u>3346.76</u>		<u>255462.06</u>

$76\frac{55415}{167338}$  da.

The equated time of the above bills is 76 days from April 28 ; hence, the equated date is July 13. *Ans.*

(5)

8	$\times 150$	=	\$1200 ;	1200	$\times 0$	=	0000
8.50	$\times 176$	=	1496 ;	1496	$\times 15$	=	22440
9	$\times 200$	=	<u>1800 ;</u>	1800	$\times 40$	=	<u>72000</u>
			<u>4496</u>				<u>94440</u>

$94440 \div 4496 = 21\frac{3}{82}$ , or 21 days, *Ans.*

(2)

The use of \$900 for 5 mo. = that of  $\$900 \times 5 = \$4500$  for 1 mo.; it will require as many months as 480 is contained in 4500, that the use of \$480 may equal that of \$4500 for one month;  $4500 \div 480 = 9\frac{3}{8}$  mo. *Ans.*

(3)

$7\frac{1}{2} \times 100 = \$750$ , cost of flour;  $750 \times 3 = 2250$   
 $.80 \times 500 = \$400.00$ , cost of wheat;  $2250 \div 400 = 5\frac{5}{8}$  mo. *A.*

(2)

$\$2500 \times 4$  mo. = \$10000 for 1 month;  
 $\frac{1600}{900} \times 3$  mo. =  $\frac{4800}{5200}$  for 1 "  
 $\$900$  \$5200 for 1 "

$5200 \div 900 = 5\frac{7}{9}$  mo. from the date of the debt; or,  
 $5\frac{7}{9} - 3 = 2\frac{7}{9}$  mo. after the payment of \$1600 *Ans.*

Or, \$1600 for 1 mo. = \$1600 for 1 mo.; as 1600 was paid one month before the time, the balance \$900 may be retained as many months beyond the time, as 900 is contained in 1600;  $1600 \div 900 = 1\frac{7}{9}$  mo. after 4 mo.; or  $2\frac{7}{9}$  mo. after 3 mo. *Ans.*

(3)

$400 \times 3 = \$1200$  for 1 mo.;  $1600 \times 6 = \$9600$  for 1 mo.  
 $400 \times 4 = 1600$  for 1 "  $\frac{1100}{4300}$  for 1 "  
 $300 \times 5 = 1500$  for 1 " bal., \$500 = \$5300 for 1 "  
 $\$1100$   $\frac{4300}{5300 \div 500 = 10\frac{3}{5}}$  mo. from  
date of debt, or  $10\frac{3}{5}$  mo. - 5 =  $5\frac{3}{5}$  mo. after last payment. *A.*

(4)

\$900 was due 9 mo. after Jan. 1, or, Oct. 1 = 273 days;

\$520 was paid on June 15, or, 165 days from Jan. 1.

$900 \times 273 = 245700$ ;  $159900 \div 380 = 420\frac{15}{19}$  da., or  
 $520 \times 165 \div 85800$ ; 421 da. from Jan. 1, = Feb. 26 of  
380 159900 next year. *Ans.*

(5)

\$500 was due on Feb. 6, 1857, or 92 days from Nov. 6 ;

\$350 was paid on Dec. 3, or 27 days from Nov. 6.

$$\begin{array}{rcl}
 500 \times 92 = 46000 ; & 36550 \div 150 = 243\frac{2}{3} \text{ days, or} \\
 \underline{350 \times 27 = 9450} ; & 244 \text{ days from Nov. 6, = July 8,} \\
 150 & 36550 & 1857.
 \end{array}$$

<i>Dr.</i>	<i>mult.</i>	( 2 )	<i>Cr.</i>	<i>mult.</i>	
Jan. 1 ..	$500 \times 79 =$	39500	Jan. 5 ..	$350 \times 75 =$	26250
" 16 ..	$450 \times 64 =$	28800	" 19 ..	$780 \times 61 =$	47580
Feb. 5 ..	$680 \times 44 =$	29920	" 25 ..	$250 \times 55 =$	13750
" 24 ..	$300 \times 25 =$	7500	Feb. 15 ..	$600 \times 34 =$	20400
Mar. 1 ..	$150 \times 19 =$	2850		<u>1980</u>	<u>107980</u>
" 16 ..	$600 \times 4 =$	2400			
	<u>2680</u>	<u>110970</u>			
		<u>107980</u>			
		2990			

$2680 - 1980 = \$700$ , merch. balance ;  $2990 \times \frac{.07}{360} = \$.58$ , interest balance ;  $700 + .58 = \$700.58$ , cash balance. *Ans.*

(3)

*Dr.*

July 1 ..	Due Jan. 1 ..	$750 \times 31 =$	23250
" 17 ..	" " 17 ..	$600 \times 15 =$	9000
" 25 ..	" " 25 ..	$800 \times 7 =$	5600
		<u>2150</u>	<u>37850</u>

*Cr.*

Feb. 6 ..	Due Aug. 6 ..	$800 \times 179 =$	143200
Mar. 7 ..	" Sept. 7 ..	$900 \times 147 =$	132300
		<u>1700</u>	<u>275500</u>
			<u>37850</u>
			237650

$2150 - 1700 = \$450$ , merch. balance ;  
 $237650 \times \frac{.07}{360} = \$46.20$ , interest balance ;  
 $450 - 46.20 = \$403.80$ , cash balance. *Ans.*

(4)

*Dr.*

May 1 ..	Due Aug. 1 ..	500 × 91 =	45500
" 20 ..	" " 20 ..	675 × 72 =	48600
June 6 ..	" Sept. 6 ..	350 × 55 =	19250
July 9 ..	" Oct. 9 ..	175 × 22 =	3850
		<u>1700</u>	<u>117200</u>

*Cr.*

May 6 ..	Due Aug. 6 ..	400 × 86 =	34400
" 25 ..	" " 25 ..	620 × 67 =	41540
June 16 ..	" Sept. 16 ..	900 × 45 =	40500
July 20 ..	" Oct. 20 ..	400 × 11 =	4400
		<u>2320</u>	<u>120840</u>
			<u>117200</u>

 $2320 - 1700 = \$620$ , merch. balance ; 3640
 $3640 \times \frac{.07}{360} = \$70$ , interest balance ;

 $620 \times .70 = \$620.70$ , cash balance. *Ans.*

(1)

*Dr.*

Jan. 16 ..	716.75 × 76 =	54473
" 25 ..	900.00 × 67 =	60300
Feb. 7 ..	2765.50 × 54 =	149337
Mar. 19 ..	791.25 × 14 =	11077.50
	<u>5173.50</u>	<u>275187.50</u>
	4327.40	182625.95
	<u>846.10</u>	) 92561.55(109 da.

*Cr.*

Jan. 19 ..	500.15 × 73 =	36510.95
Feb. 1 ..	1915.25 × 60 =	114915.
Mar. 7 ..	1200.00 × 26 =	31200.
Apr. 2 ..	712.00 × 0 =	00000.
	<u>4327.40</u>	<u>182625.95</u>

Since both balances are on the same side, the equated time is 109 da. forward from April 2 ; or, July 20. *Ans.*



(2)

<i>Dr.</i>	May 6 ..	7150.00	$\times 60 =$	429000	
	" 16 ..	475.00	$\times 50 =$	23750	
	June 17 ..	3475.25	$\times 18 =$	62554.50	
	" 21 ..	1516.50	$\times 14 =$	21231.00	
	July 5 ..	279.00	$\times 0 =$	00000.00	
		<u>12895.75</u>		<u>536535.50</u>	
		10446.00		323279.50	
	Balance,	<u>2449.75</u>		<u>213256.00</u>	(87 da.

<i>Cr.</i>	May 9 ..	2450.00	$\times 57 =$	139650.00	
	" 21 ..	915.00	$\times 45 =$	41175.00	
	June 12 ..	4165.50	$\times 23 =$	95806.50	
	" 19 ..	2915.50	$\times 16 =$	46648.00	
		<u>10446.00</u>		<u>323279.50</u>	

Since both balances are on the same side, the equated time is 87 days forward from July 5 ; or, Sept. 30. *Ans.*

*Dr.* (3)

June 6 ..	8000	$\times 40 =$	320000.00	
" 23 ..	1756.50	$\times 23 =$	40399.50	
" 30 ..	2890.75	$\times 16 =$	46252.00	
July 12 ..	3000.15	$\times 4 =$	12000.60	
	<u>15647.40</u>		<u>418652.10</u>	
	12981.50		411797.75	
	<u>2665.90</u>		<u>6854.35</u>	( $\frac{2152255}{266590}$ day ; or,

3 days forward from July 16 = July 19.

<i>Cr.</i>	June 2 ..	7450.75	$\times 44 =$	327833.00	
	" 19 ..	2695.25	$\times 27 =$	72771.75	
	July 10 ..	1865.50	$\times 6 =$	11193.00	
	" 16 ..	970.00	$\times 0 =$	00000.	
		<u>12981.50</u>		<u>411797.75</u>	

## ACCOUNT OF SALES.

Nov. 5.	Commission at $2\frac{1}{2}\%$ on \$517.50	= \$12.93
Dec. 6.	" "	640.80 = 16.02
" 19.	" "	756 = 18.90
" 23.	" "	389.40 = 9.73
Nov. 5 ..	$517.50 \times 48$	= 24840.00
Dec. 6 ..	$640.80 \times 17$	= 10893.60
" 19 ..	$756.00 \times 4$	= 3024.00
" 23 ..	$389.40 \times 0$	= 000.00
	<u>2303.70</u>	<u>38757.60</u>
	<u>152.58</u>	<u>4659.58</u>
	<u>2151.12</u>	<u>34098.02</u>

(151 $\frac{83072}{15122}$  days.)

Nov. 5 ..	$12.93 \times 48$	= 620.64
" 6 ..	$9.00 \times 47$	= 423.00
" 10 ..	$76.00 \times 43$	= 3268.00
Dec. 6 ..	$16.02 \times 17$	= 272.34
" 19 ..	$18.90 \times 4$	= 75.60
" 23 ..	$9.73 \times 0$	= 00.00
	<u>152.58</u>	<u>4659.58</u>

The balance is due in 16 days from Dec. 23, or, Jan. 8; or the present value of \$2151.12 for 16 days is due on Dec. 23.

## ALLIGATION.

(1)		(2)	
$1 \times .75 = .75$		$1 \times .37\frac{1}{2} = .37\frac{1}{2}$	
$3 \times .50 = 1.50$		$1 \times .50 = .50$	
$2 \times .37\frac{1}{2} = .75$		$1 \times .62\frac{1}{2} = .62\frac{1}{2}$	
<u>6</u>	<u>3.00</u>	<u>1 \times .80 = .80</u>	
	(.50. Ans.	<u>1 \times 1.00 = 1.00</u>	
		<u>5</u>	<u>3.30</u>
			(.66. Ans.

(3)	(4)
$5 \times .60 = 3.00$	$50 \times 2. = 100.$
$3 \times .96 = 2.88$	$60 \times .90 = 54.00$
$4 \times .0 = 00$	$36 \times .62\frac{1}{2} = 22.50$
$\overline{12} \quad )5.88(.49. \text{ Ans.}$	$50 \times .39 = 19.50$
	$\overline{196} \quad )196.00(\$1.00. \text{ A}$

(5)	(6)
$1 \times 70 = 70$	$1 \times 18 = 18$
$1 \times 72 = 73$	$1 \times 21 = 21$
$1 \times 73\frac{1}{2} = 73\frac{1}{2}$	$1 \times 17 = 17$
$1 \times 77 = 77$	$1 \times 19 = 19$
$1 \times 70 = 70$	$1 = 20 = 20$
$1 \times 80\frac{1}{2} = 80\frac{1}{2}$	$\overline{5} \quad )95(19 \text{ Ans.}$
$1 \times 81 = 81$	
$\overline{7} \quad )525(75 \text{ Ans.}$	

(7)	(8)
$34 \times .05 = 1.70$	$8 \times .30 = 2.40$
$102 \times .08 = 8.16$	$11 \times .25 = 2.75$
$136 \times .10 = 13.60$	$25 \times .07 = 1.75$
$34 \times .12 = 4.08$	$\overline{44} \quad )6.90(.15\frac{1}{2}, \text{ mean price.}$
$\overline{306} \quad 27.54$	
$13.77 \text{ } 50\% \quad .15\frac{1}{2} - .15 = \$.00\frac{1}{2}, \text{ loss per lb. ;}$	
$27.54 \quad .00\frac{1}{2} \times 44 = \$.030, \text{ loss. Ans.}$	
$306 \overline{41.31}(.13\frac{1}{2} \text{ Ans.}$	

## ALLIGATION ALTERNATE.

(1)

12	$\left\{ \begin{array}{c} 8 \\ 10 \\ 14 \end{array} \right\}$	$\left  \begin{array}{c} \frac{1}{4} \\ \frac{1}{2} \end{array} \right $	$\left  \begin{array}{c} \frac{1}{2} \\ \frac{1}{2} \end{array} \right $	$\left  \begin{array}{c} 1 \\ 2 \end{array} \right $	$\left  \begin{array}{c} 1 \\ 1 \end{array} \right $	$\left  \begin{array}{c} 1 \\ 3 \end{array} \right $
----	---	--	--	--	--	--

1 lb. at 8 cents ; 1 lb. at 10 cents ; 3 lb. at 14 cents.



(3)

$$96 \left\{ \begin{array}{l} 84 \\ 90 \\ 108 \\ 114 \end{array} \right\} \left| \begin{array}{l} \frac{1}{12} \\ \frac{1}{18} \end{array} \right| \left| \begin{array}{l} \frac{1}{12} \\ \frac{1}{12} \end{array} \right| \left| \begin{array}{l} 3 \\ 2 \end{array} \right| \left| \begin{array}{l} 2 \\ 1 \end{array} \right| \left| \begin{array}{l} 3 \times 12 = 36 \\ 2 \times 12 = 24 \\ 1 \times 12 = 12 \\ 2 \times 12 = 24 \end{array} \right.$$

$$24 \div 2 = 12 = 24 = \text{ratio};$$

36 gal. at 7s., 24 at 7s. 6d., 12 at 9s., and 24 at 9s. 6d.

(4)

$$1.25 \left\{ \begin{array}{l} 75 \\ 200 \end{array} \right\} \left| \begin{array}{l} \frac{1}{50} \\ \frac{1}{75} \end{array} \right| \left| \begin{array}{l} 3 \times 5 = 15 \\ 2 \times 5 = 10 \end{array} \right.$$

$$10 \div 2 = 5 = \text{ratio}; 15 \text{ at } \$\frac{3}{4}, \text{ and } 10 \text{ at } \$2. \text{ Ans.}$$

(5)

$$8 \left\{ \begin{array}{l} 5 \\ 7 \\ 7\frac{1}{2} \\ 9\frac{1}{2} \\ 10 \end{array} \right\} \left| \begin{array}{l} \frac{1}{3} \\ \frac{1}{2} \end{array} \right| \left| \begin{array}{l} 1 \\ \frac{3}{4} \end{array} \right| \left| \begin{array}{l} 2 \\ 3 \end{array} \right| \left| \begin{array}{l} 2 \\ 1 \end{array} \right| \left| \begin{array}{l} 8 \\ 3 \end{array} \right| \left| \begin{array}{l} 2 \times 12\frac{1}{2} = 25 \\ 2 \times 12\frac{1}{2} = 25 \\ 8 \times 12\frac{1}{2} = 100 \\ 3 \times 12\frac{1}{2} = 37\frac{1}{2} \\ 4 \times 12\frac{1}{2} = 50 \end{array} \right.$$

$$50 \div 4 = 12\frac{1}{2} = \text{ratio};$$

25 lb. each, at 5 and 7 cts.; 100 at  $7\frac{1}{2}$ ,  $37\frac{1}{2}$  at  $9\frac{1}{2}$ , and 50 at 10.

(1)

$$7 \left\{ \begin{array}{l} 5 \\ 6 \\ 8 \\ 9 \end{array} \right\} \left| \begin{array}{l} \frac{1}{2} \\ \frac{1}{2} \end{array} \right| \left| \begin{array}{l} 1 \\ 1 \end{array} \right| \left| \begin{array}{l} 1 \\ 1 \end{array} \right| \left| \begin{array}{l} 1 \\ 1 \end{array} \right| \left| \begin{array}{l} 1 \times 22 = 22 \\ 1 \times 22 = 22 \\ 1 \times 22 = 22 \\ 1 \times 22 = 22 \end{array} \right.$$

$$88 \div 4 = 22 = \text{ratio}; 22 \text{ lb. of each. Ans.}$$

(2)

$$2\frac{1}{4} \left\{ \begin{array}{l} 0 \\ 2\frac{1}{2} \\ 3 \end{array} \right\} \left| \begin{array}{l} \frac{4}{9} \\ \frac{4}{3} \end{array} \right| \left| \begin{array}{l} \frac{4}{9} \\ 4 \end{array} \right| \left| \begin{array}{l} 4 \\ 12 \end{array} \right| \left| \begin{array}{l} 4 \\ 36 \end{array} \right| \left| \begin{array}{l} 8 \times 1\frac{1}{8} = 9 \\ 36 \times 1\frac{1}{8} = 40\frac{1}{2} \\ 12 \times 1\frac{1}{8} = 13\frac{1}{2} \end{array} \right.$$

56

$$63 \div 56 = 1\frac{1}{8} = \text{ratio};$$

9 gal. of water,  $40\frac{1}{2}$  gal. at  $\$2\frac{1}{2}$ , and  $13\frac{1}{2}$  at  $\$3$ . Ans.

(3)

Average price of the animals =  $48 \div 40 = \$1\frac{1}{5}$ 

$$11 \left\{ \begin{array}{l} 37 \\ 1\frac{1}{4} \\ 1\frac{3}{4} \end{array} \right\} \left| \begin{array}{l} 20 \\ 20 \\ 20 \end{array} \right| \left| \begin{array}{l} 20 \\ 20 \\ 20 \end{array} \right| \left| \begin{array}{l} 20 \\ 20 \\ 20 \end{array} \right| \left| \begin{array}{l} 20 \\ 20 \\ 20 \end{array} \right| \left| \begin{array}{l} 240 \times \frac{1}{15} = 16 \\ 180 \times \frac{1}{15} = 12 \\ 180 \times \frac{1}{15} = 12 \end{array} \right|$$

600

$$40 \div 600 = \frac{40}{600} = \frac{1}{15} = \text{ratio};$$

16 lambs, and 12 sheep, and 12 calves. *Ans.*

(4)

Average price of the stoves = \$9;

$$9 \left\{ \begin{array}{l} 6 \\ 7 \\ 19 \end{array} \right\} \left| \begin{array}{l} 1 \\ 1 \\ 1 \end{array} \right| \left| \begin{array}{l} 1 \\ 1 \\ 1 \end{array} \right| \left| \begin{array}{l} 10 \\ 10 \\ 3 \end{array} \right| \left| \begin{array}{l} 10 \\ 10 \\ 2 \end{array} \right| \left| \begin{array}{l} 10 \times \frac{4}{5} = 8 \\ 10 \times \frac{4}{5} = 8 \\ 5 \times \frac{4}{5} = 4 \end{array} \right|$$

25

$$20 \div 25 = \frac{20}{25} = \frac{4}{5} = \text{ratio}; 8 \text{ at } 6 \text{ and } 7, \text{ and } 4 \text{ at } 19. \text{ } A.$$

(5)

$$5 \left\{ \begin{array}{l} 4 \\ 6 \\ 8 \\ 10 \end{array} \right\} \left| \begin{array}{l} 1 \\ 1 \\ 1 \\ 1 \end{array} \right| \left| \begin{array}{l} 1 \\ 1 \\ 1 \\ 1 \end{array} \right| \left| \begin{array}{l} 1 \\ 1 \\ 1 \\ 1 \end{array} \right| \left| \begin{array}{l} 5 \\ 5 \\ 5 \\ 5 \end{array} \right| \left| \begin{array}{l} 3 \\ 3 \\ 3 \\ 3 \end{array} \right| \left| \begin{array}{l} 1 \\ 1 \\ 1 \\ 1 \end{array} \right| \left| \begin{array}{l} 9 \\ 9 \\ 9 \\ 9 \end{array} \right| \left| \begin{array}{l} 90 \\ 10 \\ 10 \\ 10 \end{array} \right|$$

$$9 + 1 + 1 + 1 = 12; 120 \div 12 = 10.$$

(6)

$$6 \left\{ \begin{array}{l} 2 \\ 5 \\ 12 \end{array} \right\} \left| \begin{array}{l} 1 \\ 1 \\ 1 \end{array} \right| \left| \begin{array}{l} 1 \\ 1 \\ 1 \end{array} \right| \left| \begin{array}{l} 3 \\ 3 \\ 3 \end{array} \right| \left| \begin{array}{l} 6 \\ 6 \\ 6 \end{array} \right| \left| \begin{array}{l} 3 \\ 3 \\ 3 \end{array} \right| \left| \begin{array}{l} 1 \\ 1 \\ 1 \end{array} \right| \left| \begin{array}{l} 6 \\ 12 \\ 6 \end{array} \right|$$

$$1 + 2 + 1 = 4; 24 \div 4 = 6.$$

(7)

$$17 \left\{ \begin{array}{l} 15 \\ 20 \\ 22 \\ 24 \end{array} \right\} \left| \begin{array}{l} 1 \\ 1 \\ 1 \\ 1 \end{array} \right| \left| \begin{array}{l} 1 \\ 1 \\ 1 \\ 1 \end{array} \right| \left| \begin{array}{l} 1 \\ 1 \\ 1 \\ 1 \end{array} \right| \left| \begin{array}{l} 7 \\ 7 \\ 7 \\ 7 \end{array} \right| \left| \begin{array}{l} 5 \\ 5 \\ 5 \\ 5 \end{array} \right| \left| \begin{array}{l} 3 \\ 3 \\ 3 \\ 3 \end{array} \right| \left| \begin{array}{l} 15 \\ 2 \\ 2 \\ 2 \end{array} \right| \left| \begin{array}{l} 30 \\ 4 \\ 4 \\ 4 \end{array} \right|$$

$$15 + 2 + 2 + 2 = 21; 42 \div 21 = 2.$$

$$\begin{array}{r}
 (8) \\
 2 \left\{ \begin{array}{c} \frac{1}{2} \\ 1 \\ 5 \end{array} \right. \left| \begin{array}{c} \frac{2}{3} \\ \frac{1}{3} \end{array} \right| \left| \begin{array}{c} 1 \\ \frac{1}{3} \end{array} \right| \left| \begin{array}{c} 2 \\ 1 \end{array} \right| \left| \begin{array}{c} 3 \\ 1 \end{array} \right| \left| \begin{array}{c} 2 \\ 3 \\ 2 \end{array} \right| \left| \begin{array}{c} 10 \\ 15 \\ 10 \end{array} \right. \\
 2 + 3 + 2 = 7; 35 \div 7 = 5.
 \end{array}$$

## CUSTOM-HOUSE BUSINESS.

(3)

$$\begin{aligned}
 9 \text{ cwt. } 3 \text{ qr. } 24 \text{ lb.} &= 999 \text{ lb.}; & 999 - 146 &= 853 \text{ lb.} \\
 10 \text{ cwt. } 2 \text{ qr. } 12 \text{ lb.} &= 1062 \text{ lb.}; & 1062 - 150 &= 912 \text{ lb.} \\
 11 \text{ cwt. } 1 \text{ qr. } 24 \text{ lb.} &= 1149 \text{ lb.}; & 1149 - 158 &= 991 \text{ lb.} \\
 & & \underline{2756 \text{ lb.}} &= 27.56 \text{ cwt} \\
 27.56 \times \$9.47 &= \$260.9932 \text{ Ans.}
 \end{aligned}$$

(4)

$$\begin{aligned}
 8 \text{ cwt. } 2 \text{ qr. } 14 \text{ lb.} &= 664 \text{ lb.}; & 664 - 94 &= 570 \text{ lb.} \\
 9 \text{ cwt. } 1 \text{ qr. } 20 \text{ lb.} &= 945 \text{ lb.}; & 945 - 100 &= 845 \text{ lb.} \\
 6 \text{ cwt. } 2 \text{ qr. } 22 \text{ lb.} &= 672 \text{ lb.}; & 672 - 88 &= 584 \text{ lb.} \\
 7 \text{ cwt. } 2 \text{ qr. } 24 \text{ lb.} &= 774 \text{ lb.}; & 774 - 89 &= 685 \text{ lb.} \\
 8 \text{ cwt. } 0 \text{ qr. } 13 \text{ lb.} &= 813 \text{ lb.}; & 813 - 100 &= 713 \text{ lb.} \\
 & & \underline{3397 \text{ lb.}} & \\
 3397 \times .21 &= \$713.37 \text{ Ans.}
 \end{aligned}$$

(5)

$$\begin{aligned}
 8 \text{ cwt. } 3 \text{ qr. } 14 \text{ lb.} &= 8.89 \text{ cwt.}; & 8.89 \times 18 &= 160.02 \text{ cwt.}; \\
 160.02 \text{ cwt.} \times 16 &= 2560.32 \text{ lb.} = 25.6032 \text{ cwt.}; \\
 160.02 - 25.6032 &= 134.4168 \text{ cwt.} = 6 \text{ T. } 14 \text{ cwt. } 1 \text{ qr. } 16.68 \text{ lb}
 \end{aligned}$$

(6)

$$\begin{aligned}
 7 \text{ T. } 11 \text{ cwt. } 3 \text{ qr.} &= 151.75 \text{ cwt.}; & 151.75 \times 12 &= 1821 \text{ lb.} = \\
 18.21 \text{ cwt.}; & 151.75 - 18.21 &= 133.54 \text{ cwt.} = 6 \text{ T. } 13 \text{ cwt.} \\
 2 \text{ qr. } 4 \text{ lb.}; & 133.54 \times 2.31 &= \$308.4774 \text{ Ans.}
 \end{aligned}$$

(7)

 $19 \text{ cwt. } 1 \text{ qr. } 24 \text{ lb.} = 1949 \text{ lb.};$ 
 $1949 - 149 = 1800 \text{ lb.} = 18 \text{ cwt.};$ 
 $18 \times 24.28 = \$437.04;$ 
 $12 \text{ cwt. } 3 \text{ qr. } 19 \text{ lb.} = 1294 \text{ lb.};$ 
 $1294 - 49 = 1245 \text{ lb.} = 12.45 \text{ cwt.};$ 
 $12.45 \times 28.56 = \$355.572;$ 
 $437.04 + 355.572 = \$792.612 \text{ Ans.}$ 

(8)

 $10 \text{ cwt. } 1 \text{ qr. } 14 \text{ lb.} = 10.39 \text{ cwt.};$ 
 $10.39 \times 17\frac{1}{4} = 179.2275 \text{ cwt., or } 17922.75 \text{ lb.};$ 
 $7 + 4 = 11 \text{ lb.}; 179.2275 \times 11 = 1971.5025 \text{ lb., draft \& tare.}$ 
 $17922.75 - 1971.5027 = 15951.2475 \text{ lb.} = 159.512475 \text{ cwt.};$ 
 $159.512475 \times \$7.50 = \$1196.343 + \text{Ans.}$ 

(9)

 $4 \text{ cwt. } 3 \text{ qr. } 14 \text{ lb.} = 4.89 \text{ cwt.}; 4.89 \times 7 = 34.23 \text{ cwt.};$ 
 $34.23 \times 7 = 239.61 \text{ lb., draft}; 8 \times 7 = 56 \text{ lb., tare};$ 
 $239.61 + 56 + 99.75 = 395.36 \text{ lb.};$ 
 $3423 - 395.36 = 3027.64 \text{ lb.} = 30.2764 \text{ cwt.};$ 
 $30.2764 \times 8.45 = \$255.835 + \text{Ans.}$ 

(10)

 $22.50 + 12.49 + 5.11 + 1.31 = \$41.41;$ 
 $11 \text{ cwt. } 1 \text{ qr. } 15 \text{ lb.} = 11.40 \text{ cwt., or } 1140 \text{ lb.};$ 
 $11.40 \times 11\frac{1}{2} = 127.68 \text{ lb., tare};$ 
 $1140 - 127.68 = 10.1232 \text{ cwt.};$ 
 $41.41 = 10.1232 \text{ cwt.} = \$4.09 + \text{Ans.}$ 

(11)

 $87 \times 47 = 4089 \text{ gal.}; 4089 \times 9 = 36801 \text{ lb.};$ 
 $36801 \div 11 = 3345.5454 + \text{tare};$ 
 $36801 - 3345.5454 = 33455.4546 \text{ lb.} = 334.55454 \text{ cwt.};$ 
 $334.55454 \times 1.19 = \$398.1199 \text{ Ans.}$



( 12 )

13 cwt. 1 qr. 12 lb. = 1337 lb. ;  $1337 \times 5 = 6685$  lb., or  
 $66.85$  cwt. ;  $1\frac{1}{2} + 5\frac{1}{2} = 7$  lb. ;  $66.85 \times 7 = 467.95$  lb. ;  
 $6685 - 467.95 = 6217.05$  lb., net weight ;  
 $6217.05 \times .07\frac{1}{2} = \$466.278 +$  *Ans.*

( 13 )

$450 \times 76 = 34200$  lb. ;  $34200 \times .08 = 2736$  lb., tare ;  
 $34200 - 2736 = 31464$  lb. net weight ;  
 $31464 \times .10\frac{1}{2} = \$3303.72$ , cost ;  $3303.72 \times .33\frac{1}{3} = \$1101.24$ ,  
 whole gain ;  $3303.72 + 1101.24 = \$4404.96$  ;  
 $4404.96 \div 31464 = \$.14$  per pound. *Ans.*

( 14 )

$176 \times 46\frac{1}{4} = 8140$  yd. ;  $8140 \times 3.25 = \$26455$  ;  
 $26455 \times .30 = 7936.50$ , duty. *Ans.*

( 15 )

54 T. 13 cwt. 3 qr. 20 lb. = 54.6975 tons ;  
 $54.6975 \times 45 = \$2461.3875$ , cost ;  
 $2461.3875 \times .33\frac{1}{3} = \$820.4625$ , duty. *Ans.*

( 16 )

$225 \times 160 = 36000$  lb. ;  $36000 \times .02 = 720$ , tare ;  
 $36000 - 720 = 35280$  lb. ;  $35280 \times .06 = \$2116.80$ , cost ;  
 $2116.80 \times .20 = \$423.36$ , duty. *Ans.*

( 17 )

$275 \times 2\frac{3}{4} = 756.25$  gal. ;  $756.25 \times .05 = 37.8125$ , tare ;  
 $756.25 - 37.8125 = 718.4375$  gal. ;  
 $718.4375 \times 35 = \$251.453 +$ , duty. *Ans.*

(18)

$$175 \times 196 = 34300 \text{ lb. ; } 34300 \times .15 = 5145 \text{ lb., tare ;}$$

$$34300 - 5145 = 29155, \text{ net weight ;}$$

$$29155 \times .05 = \$1457.75, \text{ duty. } \textit{Ans.}$$

(19)

$$2 \text{ cwt. } 2 \text{ qr. } 24 \text{ lb.} = 2.74 \text{ cwt. ; } 2.74 \times 75 = 205.5 \text{ cwt. ;}$$

$$205.5 \times .11 = 22.605, \text{ tare ;}$$

$$205.5 - 22.605 = 182.895 \text{ cwt., net weight ;}$$

$$182.895 \times .01\frac{7}{8} = \$342.928; 342.928 \times .20 = \$68.5856, \text{ duty.}$$

## TONNAGE OF VESSELS.

(1)

$$(75 - \frac{3}{5} \text{ of } 20) \times 20 \times 17 = 21420; 21420 \div 95 = 225\frac{2}{19} \text{ T.}$$

(2)

$$90 \text{ ft.} \times 22 \text{ ft. } 7 \text{ in.} \times 20 \text{ ft. } 6 \text{ in.} = 41666\frac{1}{4} \text{ ft. ;}$$

$$41666\frac{1}{4} \div 95 = 438\frac{45}{8} \text{ tons. } \textit{Ans.}$$

(3)

$$154 \text{ ft.} \times 30 \text{ ft. } 8 \text{ in.} \times 14 \text{ ft. } 8 \text{ in.} = 69265\frac{7}{9} \text{ ft. ;}$$

$$69265\frac{7}{9} \div 95 = 729\frac{97}{855} \text{ tons. } \textit{Ans.}$$

(4)

$$34 - 4 = 30 \text{ feet ;}$$

$$125 \times 25.5 \times 30 = 95625 \text{ ft. ; } 95625 \div 95 = 1006.57 + \text{T.}$$

## EXCHANGE.

(1)

$$8465 \times .01\frac{1}{2} = \$126.975; 8465 + 126.975 = \$8591.975. \textit{A.}$$

(2)

$$8746.50 \times .01\frac{1}{4} = \$109.33125;$$

$$8746.50 - 109.33125 = \$8637.168 + \textit{Ans.}$$

(3)

$$9876.40 \times .01 = \$98.764 ; 9876.40 - 98.764 = \$9777.636$$

(4)

$$10000 \times .0075 = \$75, \text{ premium ; } 10000 + 75 = \$10075, \text{ value of bill at sight ; } (10000 \times .06 \div 12) \times 2.1 = \$105, \text{ interest for 60 days and 3 days' grace ; } 10075 - 105 = \$9970 \text{ A.}$$

(5)

$$1.00 - .0075 = .9925 = 99\frac{1}{4}\% \text{ of the face of the bill} = \$14875 ; \\ 14875 \div 99\frac{1}{4} = \$15006.305 + \text{face of the bill. Ans.}$$

(6)

$$.06, \text{ rate of interest per annum} = .0055 \text{ for 33 days ; } \\ .01 + .0055 = .0155 = \text{deductions ; } 1.00 - .0155 = .9845 ; \\ 9650 \div .9845 = \$9801.9299 \text{ Ans.}$$

(2)

$$\pounds 36794 \text{ 8s. 9d.} = \pounds 36794.4375 ; 36794.4375 \times .07\frac{1}{2} = \\ 2851.5689 + \text{prem. ; } 36794.4375 + 2851.5689 = \pounds 39646.0064 ; \\ 39646.0064 \times \frac{40}{9} = \$176204.4729 + \text{Ans.}$$

(3)

$$4.44444\frac{4}{9} \times .09 = .40, \text{ premium ; } 4.44444 + .40 = \$4.84444 = \\ \pounds 1 ; 67894.25 \div 4.84444 = \pounds 14014.8809 = \pounds 14014 \text{ 17s. } \\ 7\text{d. 1 far. Ans.}$$

(4)

$$\pounds 1256.9375 \times .07\frac{1}{2} = \pounds 94.2703 ; \\ 1256.9375 + 94.2703 = \pounds 1351.2078 ; \\ 1351.2078 \times 4.44\frac{4}{9} = \$6005.368 \text{ Ans.}$$

(5)

$$\begin{aligned} £364.9333 \times .08\frac{1}{4} &= £30.10699 + ; \\ 364.9333 + 30.10699 &= 395.0402 ; \\ 395.0402 \times 4.44\frac{4}{5} &= \$1755.734 + ; \\ 1755.734 - 947.86 &= \$807.874 + \text{ Ans.} \end{aligned}$$

(6)

$$\begin{aligned} £1569 \text{ 10s.} &= £1569.5 ; 1569.5 \times .12 = £188.34 \text{ premium ;} \\ (1569.5 + 188.34) \times \frac{4}{5} &= \$7812.622 + ; \\ 7812.622 \times .26 &= \$2031.28172, \text{ gain ;} \\ 2031.28172 + 7812.622 &= \$9843.90372, \text{ selling price ;} \\ 9843.90372 \times .02\frac{1}{2} &= \$246.09759, \text{ commission ;} \\ 246.097 + 416 + 85 &= \$747.097 + = \text{sum of deductions ;} \\ 9843.903 - 747.097 &= \$9096.806 + \text{ Ans.} \end{aligned}$$

(2)

$$\begin{aligned} \$17326.274 \div 186 &= 93152.01 + \text{ francs ;} \\ 93152.01 - 86978 &= 6174.01 ; 6174.01 \div 86978 = 07 = 7\%. \end{aligned}$$

(3)

$$\begin{aligned} 18.6 \times .03 &= .558 ; 18.6 - .558 = 18.042 \text{ cents.} \\ 68097 \times 18.042 &= \$12286.06 \text{ Ans.} \end{aligned}$$

(4)

$$\$16785.25 \times 5.04 = 84597 \text{ francs 66 centimes. Ans.}$$

(1)

$$\begin{aligned} 35 \times .02 &= .7 ; 35 + .7 = 35.7 \text{ cents ;} \\ 18649 \times 35.7 &= \$6657.693 \text{ Ans.} \end{aligned}$$

(2)

$$\begin{aligned} 3678 \times .34 &= \$1250.52 \text{ Ans. ; } 35 - 34 = .01 ; \\ .01 \div 35 &= .01 = 3\% \text{ nearly, below par.} \end{aligned}$$

## ARBITRATION OF EXCHANGE.

(2)

\$1 =  $\frac{1}{1.86}$  £; 1 £ = 14 marcs banco; 1 marc =  $\frac{8}{100}$  florin

$$\text{hence, } \frac{1}{\frac{1.86}{2.43}} \times \frac{14}{1} \times \frac{8}{100} \times \frac{500}{1} = 5761.31 + \text{ florins. } Ans.$$

(3)

\$1 at Boston = \$.99 $\frac{3}{4}$  N. Y.; \$1 N. Y. = \$.99 $\frac{3}{8}$  N. O.;  
\$1 N. O. = \$1.00 $\frac{1}{2}$  Natch.; .99 $\frac{3}{4}$   $\times$  .99 $\frac{3}{8}$   $\times$  1.00 $\frac{1}{2}$   $\times$  10000  
\$9962.219 + *Ans.*

(4)

1 £ = 24.15 fr.; 1 fr. =  $\frac{1}{2}$  flor.; 1 sti. = 5 centimes;  
2 flor. 15 sti. = 2.75 flor.; 1 flor. =  $\frac{1}{2}$  Sp. doll.;  
 $\frac{24.15}{1} \times \frac{1}{2} \times \frac{1}{2} \times 862.5 = 3495.839 + \text{ Sp. dolls. } Ans.$

## INVOLUTION.

(1)

$$(4)^2 = 16 \text{ } A.$$

(2)

$$(15)^2 = 225 \text{ } A.$$

(3)

$$(.142)^2 = 20164 \text{ } .$$

(4)

$$(463)^2 = 214369 \text{ } Ans.$$

(5)

$$(1340)^2 = 1795600 \text{ } An$$

(6)

$$(.246)^2 = 605.16 \text{ } Ans.$$

(7)

$$(.526)^2 = .276676 \text{ } Ar$$

(8)

$$(3.125)^2 = 9.765625 \text{ } Ans.$$

(9)

$$(.0524)^2 = .00274576 \text{ } Ar$$

(10)

$$\left(\frac{3}{4}\right)^2 = \frac{9}{16} \text{ } Ans.$$

(11)

$$\left(\frac{6}{7}\right)^2 = \frac{36}{49} \text{ } Ans.$$

(12)

$$\left(\frac{7}{9}\right)^2 = \frac{49}{81} \text{ } Ar$$

$$\begin{matrix} (13) \\ \left(\frac{35}{84}\right)^2 = \frac{1225}{7056} \end{matrix} A.$$

$$\begin{matrix} (14) \\ \left(\frac{125}{247}\right)^2 = \frac{15625}{61009} \end{matrix} A.$$

$$\begin{matrix} (15) \\ \left(7\frac{6}{8}\right)^2 = (7.625)^2 = 58.140625 \end{matrix} A.$$

$$\begin{matrix} (16) \\ (15\frac{9}{11})^2 = \left(\frac{174}{11}\right)^2 = \frac{30276}{121} = 250\frac{26}{121} \end{matrix} Ans.$$

$$\begin{matrix} (17) \\ (225\frac{9}{10})^2 = (225.9)^2 = 51030.81 \end{matrix} A.$$

$$\begin{matrix} (18) \\ (6)^3 = 216 \end{matrix} Ans.$$

$$\begin{matrix} (19) \\ (24)^3 = 13824 \end{matrix} Ans.$$

$$\begin{matrix} (20) \\ (125)^3 = 1953125 \end{matrix} Ans.$$

$$\begin{matrix} (21) \\ (136)^3 = 2515456 \end{matrix} Ans.$$

$$\begin{matrix} (22) \\ (12)^4 = 20736 \end{matrix} Ans.$$

$$\begin{matrix} (23) \\ (9)^5 = 59049 \end{matrix} Ans.$$

$$\begin{matrix} (24) \\ (4.25)^3 = 76.765625 \end{matrix} Ans.$$

$$\begin{matrix} (25) \\ (1.8)^4 = 10.4976 \end{matrix} Ans.$$

$$\begin{matrix} (26) \\ (.45)^5 = .0184528125 \end{matrix} Ans.$$

$$\begin{matrix} (27) \\ \left(\frac{15}{16}\right)^3 = \frac{3375}{4096} \end{matrix} A.$$

$$\begin{matrix} (28) \\ \left(\frac{5}{6}\right)^3 = \frac{125}{216} \end{matrix} A.$$

$$\begin{matrix} (29) \\ \left(\frac{3}{8}\right)^4 = \frac{81}{4096} \end{matrix} A.$$

$$\begin{matrix} (30) \\ (2\frac{1}{4})^5 = \left(\frac{9}{4}\right)^5 = 57\frac{681}{1624} \end{matrix} Ans.$$

$$\begin{matrix} (31) \\ \left(\frac{25}{27}\right)^4 = \frac{390625}{531441} \end{matrix} Ans.$$

(32)

$$(24\frac{3}{5})^3 = (24.6)^3 = 14886.936 \text{ Ans.}$$

(33)

$$(.25)^6 = .000244140625 \text{ A.}$$

(34)

$$(142.5)^3 = 2893640.625 \text{ A.}$$

## EXTRACTION OF THE SQUARE ROOT.

(3)

$$\sqrt{49} = 7 \text{ Ans.}$$

(4)

$$\sqrt{144} = 12 \text{ Ans.}$$

(5)

$$\sqrt{225} = 15 \text{ Ans.}$$

(6)

$$\sqrt{2304} = 48 \text{ Ans.}$$

(7)

$$\sqrt{7994} = 89.409+ \text{ Ans.}$$

(8)

$$\sqrt{6275025} = 2505 \text{ Ans.}$$

(9)

$$\sqrt{19000} = 137.84+ \text{ Ans.}$$

(10)

$$\sqrt{2768456} = 1663.8677+ \text{ A.}$$

(11)

$$\sqrt{36754} = 191.713+ \text{ A.}$$

(12)

$$\sqrt{1000000} = 1000 \text{ Ans.}$$

(13)

$$\sqrt{96728} = 311.011+ \text{ Ans.}$$

(14)

$$\sqrt{30225} = 173.853+ \text{ Ans.}$$

(4)

$$\sqrt{\frac{36}{81}} = \frac{6}{9} \text{ Ans.}$$

(5)

$$\sqrt{\frac{225}{2304}} = \frac{15}{48} \text{ A.}$$

(6)

$$\sqrt{.0196} = .14 \text{ Ans.}$$

(7)

$$\sqrt{6.25} = 2.5 \text{ Ans.}$$

(8)

$$\sqrt{278.89} = 16.7 \text{ Ans.}$$

(9)

$$\sqrt{.205209} = .453 \text{ Ans.}$$

(10)

$$\sqrt{\frac{7}{8}} = \sqrt{.875} = .93+ \text{ Ans.}$$

$$\begin{array}{ll} (11) & (12) \\ \sqrt{1\frac{5}{8}} = \sqrt{.9375} = .9682 + A. & \sqrt{\frac{1}{40}} = \sqrt{.025} = .1581 + \end{array}$$

$$\begin{array}{ll} (13) & (14) \\ \sqrt{5\frac{4}{9}} = \frac{49}{9} = \frac{7}{3} = 2\frac{1}{3} \text{ Ans.} & \sqrt{.7994} = .89409 + \text{ Ans.} \end{array}$$

$$\begin{array}{ll} (15) & (16) \\ \sqrt{.222\frac{2}{3}} = \sqrt{.2222222} = .4714 + & \sqrt{.60794} = .779 + A. \end{array}$$

$$\begin{array}{ll} (17) & (18) \\ \sqrt{.022201} = .149 + \text{ Ans.} & \sqrt{25.1001} = 5.01 \text{ Ans.} \end{array}$$

$$\begin{array}{ll} (19) & (20) \\ \sqrt{196.425} = 14.015 + \text{ Ans.} & \sqrt{1.5} = 1.2247 + \text{ Ans.} \end{array}$$

$$\begin{array}{lll} (21) & (22) & (23) \\ \sqrt{\frac{2809}{6241}} = \frac{53}{79} A. & \sqrt{\frac{9}{49}} = \frac{3}{7} A. & \sqrt{\frac{2}{25}} = \sqrt{.08} = .2828 + \end{array}$$

$$\begin{array}{ll} (24) & (25) \\ \sqrt{135} = 11.618 + \text{ Ans.} & \sqrt{.784} = .885 + \text{ Ans.} \end{array}$$

$$\begin{array}{ll} (26) & (27) \\ \sqrt{5647.5225} = 75.15 \text{ Ans.} & \sqrt{160048.0036} = 400.06 A. \end{array}$$

$$\begin{array}{ll} (1) & (2) \\ \sqrt{117649} = 343 \text{ men. Ans.} & \sqrt{48841} = 221 \text{ stones. A.} \end{array}$$

(3)

810 × 10 = 8100 sq. ft., area of garden ;

·  $\sqrt{8100} = 90$  ft. = length of each side ;

90 × 4 = 360 ft. = length of the four sides ;

360 ÷ 16½ = 21  $\frac{9}{11}$  rd. Ans.



(4)

By dividing the rectangle breadthwise into 3 equal parts, each of which will be a square, and equal to  $\frac{1}{3}$  of the whole area; 67 A. 2 R. = 10800 P.;  $10800 \div 3 = 3600$  P.;

$$\sqrt{3600} = 60 \text{ rd., width; } 60 \times 3 = 180 \text{ rd., length. Ans.}$$

(5)

$$3200 \div 2 = 1600, \text{ number of trees in half the field;}$$

$$\sqrt{1600} = 40, \text{ number of trees in width;}$$

$$40 \times 2 = 80, \text{ number of trees in length;}$$

$$(80 - 1) \times 12 = 948 \text{ feet long; } 948 \times 468 = 443664 \text{ sq. ft.}$$

$$(40 - 1) \times 12 = 468 \text{ feet wide;}$$

$$443664 \text{ sq. ft.} = 10 \text{ A. } 0 \text{ R. } 29 \text{ P. } 168\frac{3}{4} \text{ sq. ft., area of field.}$$

(6)

$$(45)^2 + (60)^2 = 5625; \sqrt{5625} = 75 \text{ ft. Ans.}$$

(7)

$$(225)^2 - (180)^2 = 18225; \sqrt{18225} = 135 \text{ feet high. Ans.}$$

(8)

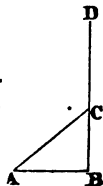
$$(65)^2 - (49)^2 = 1824; \sqrt{1824} = 42.708 \text{ ft.}$$

$$(65)^2 - (39)^2 = 2704; \sqrt{2704} = 52$$

94.708 ft., width of street.

(9)

Let BD be the height of the staff = 120 ft.  
Let CA = the part broken off; then, BC + AC = 120 feet, and BA = 40 feet.



$$\text{Then, } AC^2 - BC^2 = AB^2 = 1600.$$

$$\text{But } AC^2 - BC^2 = (AC + BC)(AC - BC) = 1600.$$

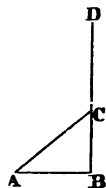
$$\text{But } AC + BC = 120 \text{ feet ; hence,}$$

$$AC - BC = 1600 \div 120 = 13\frac{1}{3}$$

Since half the difference of two numbers added to half their sum gives the greater, and subtracted from it, gives the less, we have,

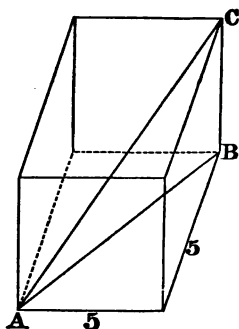
$$AC = (120 + 13\frac{1}{3}) \div 2 = 66\frac{2}{3} \text{ ft. ; and}$$

$$BC = (120 - 13\frac{1}{3}) \div 2 = 53\frac{1}{3} \text{ ft.}$$



(10)

$5^2 + 5^2 = 50$  ;  $\sqrt{50} = 7.0716+$  = diagonal A B of base ;  $(7.0716+)^2 + 5^2 = 75$  ;  $\sqrt{75} = 8.66+$  ft. = diagonal A C of the cube. *Ans.*



(11)

$$10 \times 24 \times 2 = 480 ; 14 \times 24 \times 2 = 672 \text{ miles.}$$

$$(480)^2 + (672)^2 = 681984 ; \sqrt{681984} = 825.8 \text{ miles.}$$

(12)

10 acres = 1600 sq. rd. ;  $\sqrt{1600} = 40$  rd., one equal side of a square ;  $40 \times 4 = 160$  rods, will fence the square ;  $160 \times 2.50 = \$400$ , cost of fencing the square.

$1600 \div 4 = 400$  sq. rd., one-fourth the area of the rectangle;  
 $\sqrt{400} = 20$  rods, width of rectangle;  $20 \times 4 = 80$  rods,  
length;  $(80 \times 2) + (20 \times 2) = 200$  rods, will fence the rect-  
angle;  $200 \times 2.50 = \$500$ , cost of fencing the rectangle;  
 $500 - 400 = \$100$ , difference. *Ans.*

(13)

$1 : 9 :: 25^2 : x^2 - 5625$ ;  $\sqrt{5625} = 75$  ft. *Ans.*

(14)

$120 : 1500 :: 8^2 : x^2 = 800$ ;  $\sqrt{800} = 28.28$  ft. *Ans.*

(15)

$400 : 1600 :: 3^2 : x^2 = 36$ ;  $\sqrt{36} = 6$  inches. *Ans.*

(16)

$2\frac{1}{2}$  acres = 400 sq. rd.;  $400 = .7854 = 509.295923$  +;  
 $\sqrt{509.295923} + = 22.567$  rd., diameter of the piece of ground;  
 $22.567 \div 2 = 11.283$  rods, distance from the center to the  
circumference; 4 feet = .242 + rods;  $11.283 - .242 =$   
11.041 rods.

(17)

The grindstone is a cylinder whose base is either of the  
two side circles, and altitude the thickness of the stone.  
After the first third is ground off, the remainder is a cylinder  
whose altitude is the thickness of the stone, and base two-  
thirds that of the largest circle; and these cylinders having  
the same altitude, are to each other as their bases.

As two similar figures are to each other as the squares  
of their like dimensions, two circles are to each other as the  
squares of their diameters or radii; that is, the square of the  
radius of the second circle will be two-thirds the square of the  
largest radius, and the square of the radius of the inner circle  
will be one-third the square of the largest.

Then,  $(24)^2 = 576$  ;  $576 \div 3 = 192$  sq. in. ;  $576 - 192 = 384$ , the square of the middle radius ; and  $\sqrt{384} = 19.595 =$  the radius of what is left after the first has ground off his share ;  $24 - 19.595 = 4.405$  in., the thickness of the first share.

Also,  $384 - 192 = 192$  ;  $\sqrt{192} = 13.856+$  in., the inner radius ;  $19.595 - 13.856 = 5.739$  in., the thickness of the second share ; and, 13.856, already found, is the thickness of the third share.

## CUBE ROOT.

$$\begin{array}{ccc} (1) & (2) & (3) \\ \sqrt[3]{1728} = 12 \text{ A.} & \sqrt[3]{117649} = 49 \text{ A.} & \sqrt[3]{46656} = 36 \text{ A.} \end{array}$$

$$\begin{array}{ccc} (4) & (5) \\ \sqrt[3]{15069223} = 247 \text{ Ans.} & \sqrt[3]{5735339} = 179 \text{ Ans.} \end{array}$$

$$\begin{array}{ccc} (6) & (7) \\ \sqrt[3]{48228544} = 364 \text{ Ans.} & \sqrt[3]{84604519} = 439 \text{ Ans.} \end{array}$$

$$\begin{array}{ccc} (8) & (1) \\ \sqrt[3]{28991029248} = 3072 \text{ Ans.} & \sqrt[3]{8.343} = 2.028+ \text{ Ans.} \end{array}$$

$$\begin{array}{ccc} (2) & (3) \\ \sqrt[3]{1728.729} = 12.0016+ \text{ Ans.} & \sqrt[3]{.0125} = .232+ \text{ Ans.} \end{array}$$

$$\begin{array}{ccc} (4) & (5) \\ \sqrt[3]{19683.46656} = 27.0002+ \text{ A.} & \sqrt[3]{.387420489} = .729+ \text{ A.} \end{array}$$

$$\begin{array}{ccc} (6) & (7) \\ \sqrt[3]{.000003375} = .015 \text{ Ans.} & \sqrt[3]{.0066592} = .188+ \text{ Ans.} \end{array}$$

$$(8) \\ \sqrt[3]{81.729} = 4.339 + \text{Ans.}$$

$$(1) \\ \sqrt[3]{\frac{64}{125}} = \frac{\sqrt[3]{64}}{\sqrt[3]{125}} = \frac{4}{5} \text{ Ans.}$$

$$(2) \\ \sqrt[3]{\frac{343}{729}} = \frac{\sqrt[3]{343}}{\sqrt[3]{729}} = \frac{7}{9} \text{ Ans}$$

$$(3) \\ \sqrt[3]{31\frac{14}{27}} = \frac{\sqrt[3]{10648}}{\sqrt[3]{343}} = \frac{22}{7} = 3\frac{1}{7}$$

$$(4) \\ \sqrt[3]{91\frac{1}{8}} = \frac{\sqrt[3]{729}}{\sqrt[3]{8}} = \frac{9}{2} = 4\frac{1}{2}$$

$$(5) \\ \sqrt[3]{\frac{343}{512}} = \frac{\sqrt[3]{343}}{\sqrt[3]{512}} = \frac{7}{8} \text{ Ans.}$$

$$(6) \\ \sqrt[3]{\frac{729}{15625}} = \frac{\sqrt[3]{729}}{\sqrt[3]{15625}} = \frac{9}{25} \text{ A.}$$

$$(7) \\ \sqrt[3]{\frac{19683}{262144}} = \frac{\sqrt[3]{19683}}{\sqrt[3]{262144}} = \frac{27}{64}$$

$$(8) \\ \sqrt[3]{\frac{13824}{42875}} = \frac{\sqrt[3]{13824}}{\sqrt[3]{42875}} = \frac{24}{35}$$

$$(9) \\ \sqrt[3]{7\frac{1}{8}} = \sqrt[3]{7.857142} + = 1.987 + \text{Ans.}$$

$$(10) \\ \sqrt[3]{56\frac{1}{3}} = \sqrt[3]{56.6} = 3.83 + \text{Ans.}$$

$$(1) \\ \sqrt[3]{19683} = 27 \text{ feet, each way. Ans.}$$

$$(2) \\ \sqrt[3]{6859} = 19 \text{ ft., length of each side;} \\ (19)^2 \times 6 = 2166 \text{ sq. ft., area of the whole surface.}$$

(3)

$\sqrt[3]{46656} = 36$  ft. long ;  $(36)^2 = 1296$  sq. ft., area of one side.

(4)

$150 \times 31\frac{1}{2} = 4725$  gal.;  $4725 \times 231 = 1091475$  cu. in. =  
 $631.640 +$  cu. ft.;  $\sqrt[3]{631.640} = 8.57 +$  ft., length of one side.

(5)

$1500 \div 2 = 750$  bu.;  $750 \times 2150.4 = 1612800$  cu. in. =  
 $933.333333 +$  cu. ft.;  $\sqrt[3]{933.333333} = 9.77 +$  ft., length  
 and breadth ;  $9.77 \times 2 = 19.54 +$  feet high.

(6)

$27$  cu. ft.  $\div 2 = 13.5$  cu. ft. = half a cubic yard ;  
 half a yard in length =  $1.5$  ft. ;  $(1.5)^3 = 3.375$  cu. ft. ;  
 $13.5 - 3.375 = 10.125$  cu. ft. *Ans.*

(7)

$\$911.25 = 91125$  cents ;  $\sqrt[3]{91125} = 45$  cents, what he paid  
 per yard ;  $91125 \div 45 = 2025$ , whole number of yards.

(9)

$(2.5)^3 : 5^3 :: 8 : x = 64$  pounds. *Ans.*

(10)

$1 : 8 :: 4^3 = 64 : x = 512 = 8^3$  ; 8 ft. length of each side.

(11)

$6^3 = 216 : (12)^3 = 1728 :: 1 : x = \frac{1728 \times 1}{216} = 8$  globes.

(12)

$$1^3 = 1 : (5.5)^3 = 166.375 :: 8 : x = 166.375 \times 8 = \$1331$$

(13)

$$100 : 800 :: 6^3 : x^3 = 1728 ; \sqrt[3]{1728} = 12 \text{ in. long.}$$

$$100 : 800 :: 3^3 : x^3 = 216 ; \sqrt[3]{216} = 6 \text{ in. wide.}$$

$$100 : 800 :: .5^3 : x^3 = 1 ; \sqrt[3]{1} = 1 \text{ in. thick. } \mathcal{A}$$

(14)

$$3 : 24 :: 12^3 : x^3 = 13824 ; \sqrt[3]{13824} = 24 \text{ ft. long.}$$

$$3 : 24 :: 10^3 : x^3 = 8000 ; \sqrt[3]{8000} = 20 \text{ ft. wide.}$$

$$3 : 24 :: (4.5)^3 : x^3 = 729 ; \sqrt[3]{729} = 9 \text{ ft. deep.}$$

(15)

$$2 : 16 :: 10^3 : x^3 = 8000 ; \sqrt[3]{8000} = 20 \text{ ft. } \mathcal{Ans.}$$

(16)

The yarn will be in the form of a globe, after each of the three women has taken off her share; these globes are to each other as the cubes of their diameters; and as each is to have  $\frac{1}{4}$  of the whole, 4, 3, 2, 1, will represent the relative sizes of these globes;

$$4 : 3 :: 6^3 = 216 : x = (5.45+)^3; 5.45 = 2d \text{ diameter};$$

$$6 - 5.45 = .54 \text{ in., part wound off by first woman};$$

$$4 : 2 :: 6^3 : x = (4.76+)^3; 4.76 = 3d \text{ diameter};$$

$$5.45 - 4.76 = .69 \text{ in., part wound off by second woman};$$

$$4 : 1 :: 6^3 : x = (3.77+)^3; 3.77 = 4th \text{ diameter};$$

$$4.76 - 3.77 = .99 \text{ in., part wound off by third woman};$$

$$3.77+ \text{ in., part which fourth woman had.}$$

## ARITHMETICAL PROGRESSION.

(1)

$$(18 - 1) \times 5 = 85; 85 + 4 = 89 \text{ Ans.}$$

(2)

$$(12 - 1) \times 20 = 220; 300 - 220 = \$80 \text{ Ans.}$$

(3)

$$(15 - 1) \times 14 = 196; 196 + 200 = \$396 \text{ Ans.}$$

(4)

$$50 \times 11 = 550; 1000 + 550 = \$1550 \text{ Ans.}$$

(5)

0 = first term;

$$\frac{1}{2} = \text{com diff.}; \quad (35 - 0) \times \frac{1}{2} = 17\frac{1}{2}; 17\frac{1}{2} + 0 = 17\frac{1}{2} \text{ rd.}$$

35 = No. of terms.

(6)

If he brings the farthest marble first, he will travel 300 ft., which will be the first term of a decreasing arithmetical progression, of which the number of terms is 100. Since the marbles are half a foot apart, the common difference will be 1; hence,

$300 - 99 \times 1 = 201$ , the last term, or the distance he must travel to bring the nearest marble.

(1)

In this example, the first term may be taken as 0 and 16 = number of terms;

$$75 - 0 = 75; 75 \div (16 - 1) = 5, \text{ com. diff. Ans.}$$



(2)

$$26\frac{1}{2} - \frac{1}{2} = 26; 26 \div (14 - 1) = \$2, \text{ com. diff. } \textit{Ans.}$$

(3)

$$14\frac{1}{2} - 2\frac{1}{2} = 12 \text{ in.}; 12 \div (17 - 1) = \frac{1}{6} = \frac{3}{4} \text{ in. } \textit{Ans.}$$

(4)

12 may be considered the first, and 33 the last term;

$11 - 4 = 7 =$  number of terms less 1;

$33 - 12 = 21; 21 \div 7 = 3$  com. diff.;

15, 18, 21, 24, 27, 30 are intermediate terms.

(1)

$$100 + 5 = 105; 105 \times \frac{5}{2} = \$2730 \textit{ Ans.}$$

(2)

$$(56 - 1) \times 4 = 220; 220 + 6 = 226, \text{ last term};$$

$$226 - 6 = 232; 232 \times \frac{5}{2} = \$64.96 \textit{ Ans.}$$

(3)

$$\frac{1}{4} = \text{com. diff.}; (30 - 1) \times \frac{1}{4} = 7\frac{3}{4}; 30 - 7\frac{3}{4} = 22\frac{1}{4}, \text{ last term}; 22\frac{1}{4} + 30 = 52\frac{3}{4}; 52\frac{3}{4} \times 15 = 791\frac{1}{4} \text{ miles. } \textit{Ans.}$$

(4)

6 yards = the distance of the first stone from the heap: consequently,  $2 \times 6$  yards = 12 yards = the distance to bring the first stone: hence, 12 = the first term of the progression; and  $1\frac{1}{2} \times 2 = 2\frac{1}{2}$  = the common difference, and 120 = the number of terms.

Then,  $2\frac{1}{2} \times 119 + 12 = 309\frac{1}{2}$  = last term.

$$(309\frac{1}{2} + 12) \times (120 \div 2) = 321\frac{1}{2} \times 60 = 19290 \text{ yards.}$$

$$19290 \text{ yds.} = 10 \text{ mi. } 7 \text{ fur. } 27 \text{ rd. } 1\frac{1}{2} \text{ yd.}$$

(1)

$$(500 - .50) \div .09 = 5550; 5550 + 1 = 5551 \text{ bu. } \textit{Ans.}$$

(2)

$$(33 - 15) \div 1\frac{1}{2} = 12; 12 + 1 = 13, \text{ number of terms};$$

$$(33 + 15) \times (13 \div 2) = 312 \text{ miles, sum of all the terms.}$$

(3)

$$(575 - 200) \div 75 = 5; 5 + 1 = 6, \text{ number of instalments.}$$

## GEOMETRICAL PROGRESSION.

(1)

$$\left(\frac{1}{3}\right)^7 = \frac{1}{2187}; \frac{1}{2187} \times 2187 = 1, \text{ last term. } Ans.$$

(2)

$$5^8 = 390625; 390625 \times 8 = 3125000 \text{ } Ans.$$

(3)

$$\left(\frac{1}{3}\right)^9 = \frac{1}{19683}; \frac{1}{19683} \times 729 = \frac{729}{19683} = \frac{1}{27} \text{ } Ans.$$

(4)

$$10 = \text{ratio}; (10)^{14} = 100000000000000;$$

$$100000000000000 + \$100000000000.000.$$

(5)

$$6 = \text{number of terms}; 2^5 = 32; 32 \times 100 = \$3200 \text{ } Ans.$$

(6)

His capital will treble three times in twelve years; hence,

$$3 = \text{ratio, and } 4 = \text{number of terms.}$$

$$3^3 \times 2000 = \$54000. \text{ } Ans.$$

(7)

$$2 = \text{ratio, and } 16 = \text{number of terms.}$$

$$2^{15} = 32768 \text{ cents} = \$327.68. \text{ } Ans.$$

(8)

1.06 = ratio ; \$500 = 1st term ; 4 = number of terms ;

 $1.06^3 = 1.191016$  ;  $1.191016 \times 500 = \$595.508$  *Ans.*

(1)

 $(78722 \times 3) - 4 = 236162$  ;  $236162 \div 2 = 118081$  *Ans.*

(2)

 $1024 - (4 \times \frac{1}{2}) = 1022$  ;  $1022 \div (1 - \frac{1}{2}) = 2044$  *Ans.*

(3)

4 = ratio, and 12 = number of terms.

 $4^{11} \times 2 = 8388608$ , last term, or last payment. $(8388608 \times 4) - 2 = 33554430$  ; $33554430 \div (4 - 1) = \$11184810$ , sum of payments.

(4)

2 = ratio, and 32 = number of terms.

 $(2^{31} \times 2) - 1 = 4294967295$  cents = \$42949672.95 *Ans.*

(5)

2 = ratio, and 1 the first term ;

 $2^{63} \times 1 = 9223372036854775808$ , last term ; $(9223372036854775808 \times 2) - 1 = 184467440737091551615$ 

grains, sum of all the terms, which divided by 7680 gives

2401919801264264 pints, which reduced gives 37529996894754

bushels ; this divided by 40 and 1000 gives 938249922 ships,

and a small remainder.

## ANALYSIS.

(22)

 $\frac{5}{8}$  of  $\frac{2}{3} = \frac{5}{12}$  part sold ; price  $\div$  quantity = cost of one ; hence, $1736 \div \frac{5}{12} = \$4166.40$  value of vessel. *Ans.*

(23)

$$4\frac{2}{3} \times 7\frac{1}{8} = \frac{11}{3} \times \frac{57}{8} = \frac{627}{6} = \text{hours of travelling};$$

$$627 \div 10\frac{6}{7} = \frac{627}{10\frac{6}{7}} \times \frac{7}{7} = 9\frac{5}{8} \text{ days. Ans.}$$

(24)

$$\frac{1}{8} + \frac{5}{8} = \frac{17}{8} = \text{quantity in air and mud}; 1 - \frac{17}{8} = \frac{1}{8} \text{ quantity in water} = 2 \text{ ft.}; 2 \times 18 = 36 \text{ ft.} = \text{length of pole. Ans.}$$

(25)

$$1 - \frac{1}{4} = \frac{3}{4}, \text{ remainder}; \frac{1}{5} \text{ of } \frac{3}{4} = \frac{3}{20};$$

$$\frac{1}{4} + \frac{3}{20} = \frac{8}{20} = \frac{2}{5}, \text{ amount spent}; 1 - \frac{2}{5} = \frac{3}{5} = \$1062;$$

$$1062 \div \frac{3}{5} = \$1770 \text{ Ans.}$$

(26)

$$\text{One pipe will fill } \frac{1}{7\frac{1}{2}} = \frac{2}{15} \text{ cistern in one hour, and the other}$$

$$\text{will fill } \frac{1}{4\frac{1}{8}} = \frac{8}{35} = \text{cistern in one hour};$$

$$\frac{2}{15} + \frac{8}{35} = \frac{28}{75}, \text{ what both can fill in one hour};$$

$$1 \div \frac{28}{75} = \frac{75}{28} = 2\frac{9}{28} \text{ hr.} = \text{time for both to fill the cistern. A.}$$

(27)

$$1 \text{ yard will cost } \frac{1}{34} \text{ of } 9 = \frac{9}{34} = \frac{1}{8}; \frac{1}{8} \times 26 = \$4\frac{1}{2} \text{ Ans.}$$

$$\frac{9 \times 26}{54} = \frac{13}{3} = 4\frac{1}{3}$$

(28)

$$\frac{1}{4} \text{ of } \frac{6}{7} \text{ of } \frac{7}{9} \text{ of } \frac{25}{100} \div 2 = \frac{150}{8} = \text{cost of one acre ;}$$

$$\frac{50}{150} \times \frac{1}{2} \text{ of } \frac{3}{4} \text{ of } \frac{2}{3} = \$100 \text{ Ans.}$$

(29)

$$3\frac{1}{2} \times 1\frac{3}{8} = \frac{7}{2} \times \frac{11}{8} = \frac{77}{8} \text{ sq. yd.} = \text{sq. measure of one suit ;}$$

$$\frac{77}{8} \times \frac{1000}{1} = \frac{9625}{2} \text{ sq. yd.} = \text{square measure of 1000 suits ;}$$

$$\frac{9625}{2} \div \frac{7}{8} = \frac{9625}{2} \times \frac{8}{7} = 5500 \text{ yd. shalloon. Ans.}$$

(30)

$$3\text{s. } 9\text{d.} = 45\text{d.} ; 45 \times 234 = 10530\text{d.} = \text{value of } 234 \text{ bu. ;}$$

$$10530 \div 90 = 117 \text{ lb. Ans.}$$

(31)

$$2\text{s. } 9\text{d.} = 33\text{d.} ; 33 \times 4 \times 63 \times 2 \times 3 = 49896\text{d. ;}$$

$$49896 \div 72 = \$693 \text{ Ans.}$$

(32)

$$2\text{s. } 6\text{d.} = 30\text{d.} ; 30 \times 165 = 4950\text{d.} = 4950 \div 72 = \$68.75 ;$$

$$68.75 \div 625 = \$0.11 \text{ per lb. Ans.}$$

(33)

$$3\text{s. } 4\text{d} = 40\text{d} ; 40 \times 4 \times 7 \times 3 = 3360\text{d.} : 3360 \div 60 = \$56$$

(34)

$$10\text{s. } 8\text{d.} = 128\text{d.} ; 128 \times 22\frac{1}{2} \times 14 \times 10 = 403200\text{d.} =$$

$$\$403200 \div 72 = \$5500 \text{ Ans.}$$

( 35 )

$7\frac{1}{2}$  cwt. = 750 lb. ;  $12\frac{1}{2}$  cwt. = 1250 lb. ;  $\frac{750 \times 12}{1250} = \$0.7\frac{1}{5}$  A.

( 36 )

6s. 8d. = 80d. ;  $80 \times 120 = 9600$ d. = \$100, value of the cloth ;  
 4s. 6d. = 54d. ;  $54 \times 76 = 4104$ d. = \$57, value of the rye ;  
 $100 - 57 = \$43$ , cash to balance. *Ans.*

$$\begin{array}{r} 20 \quad 5 \quad 3 \quad 19 \\ 80 \times 120 \quad 54 \times 76 \\ \hline 96 \quad 72 \\ \text{A} \quad \text{A} \end{array} = \frac{100}{1} - \frac{57}{1} = \$43$$

( 37 )

$41 \times 21 = 861$  yd. bought ;  $1.75 \times 861 = \$1506.75$ , price.  
 obtained ;  $1506.75 - 1260 = \$246.75$ , gain. *Ans.*

( 38 )

Since the hour and minute hands are together at 12, and the minute hand passes the hour hand 11 times before they are together again at 12, the minute hand will be with, and pass the hour hand between 5 and 6, in  $\frac{5}{11}$  of 12 hours ;

$$\frac{5}{11} \text{ of } 12 = 5\frac{5}{11} \text{ hr.} = 5 \text{ hr. } 27 \text{ min. } 16\frac{4}{11} \text{ sec. } \textit{Ans.}$$

( 39 )

$(18 \times 15) \div 9 = 30$  sq. yd., area of the floor ;  $30 \div \frac{3}{4} = 40$  yd.

( 40 )

If the 9 men work 1 hour a day, it will take them 12 times as long to build the house, as when they work 12 hours, viz., 60 months. If they do the same work in 6 months, they must work as many hours per day as 6 is contained times in 60 which is 10. *Ans.*

(41)

B and C do  $\frac{1}{12}$  of the work in 1 day; A, B, and C,  $\frac{1}{9}$ ;  $\frac{1}{9} - \frac{1}{12} = \frac{1}{36}$ , what A will do alone in 1 day; it will take A as many days to do the whole work as  $\frac{1}{36}$  is contained times in 1;  $1 \div \frac{1}{36} = 36$  days. *Ans.*

(42)

A can mow  $\frac{1}{3}$  of the field in 1 day; B,  $\frac{1}{4}$ ; C,  $\frac{1}{5}$  of it; A, B, and C, can mow  $\frac{1}{3} + \frac{1}{4} + \frac{1}{5} = \frac{47}{60}$  in 1 day;  $1 \div \frac{47}{60} = 1\frac{13}{47}$  days, the time it will take the three to mow it. *Ans.*

(43)

The proportional numbers are 3, 5, 7, and 9, whose sum is 24; the parts must be  $\frac{3}{24}$ ,  $\frac{5}{24}$ ,  $\frac{7}{24}$  and  $\frac{9}{24}$  of 480;  $\frac{3}{24}$  of 480 = 60;  $\frac{5}{24}$  of 480 = 100;  $\frac{7}{24}$  of 480 = 140;  $\frac{9}{24}$  of 480 = 180 *Ans.* Or,

$$\begin{aligned} 24 : 3 :: 480 : x &= 60; & 24 : 7 :: 480 : x &= 140; \\ 24 : 5 :: 480 : x &= 100; & 24 : 9 :: 480 : x &= 180. \end{aligned}$$

(44)

A square foot is equal to 144 square inches; the area divided by one dimension will give the other.

$$144 \div 8\frac{4}{7} = 16\frac{4}{7} \text{ inches. } \textit{Ans.}$$

(45)

At the end of 3 months there would be provisions for 1800 for 9 months = to provisions for 1 man for  $9 \times 1800 = 16200$  months, and for 2400 men for  $\frac{1}{2400}$  of  $16200 = 6\frac{3}{4}$  months; at the end of 4 months, the provisions would last 2400 men  $2\frac{3}{4}$  months, or 1 man 6600 months; they would last 2800 men  $\frac{1}{2800}$  of  $6600 = 2\frac{5}{14}$  months. *Ans.*

(46)

$$3\frac{1}{2} \times 117\frac{1}{2} = \$411.25, \text{ cost of broadcloth ;}$$

$$488.80 - 411.25 = \$77.55, \text{ cost of baize ;}$$

To every yard of broadcloth he had  $\frac{1}{2}$  of  $1\frac{1}{2}$  yd. of baize =  $\frac{3}{10}$  yd. ;  $\frac{3}{10} \times 117\frac{1}{2} = 35.25$  yd. of baize ;

$$77.55 \div 35.25 = \$2.20 \text{ per yard. } \textit{Ans.}$$

(47)

$3\frac{1}{2} \times 40 = 140$  cwt. ;  $12 \times 10 = 120$  cwt. ;  $\frac{1}{140}$  of  $\frac{1}{2}$  = cost of transporting 1 cwt. 150 miles ;

$\frac{1}{140}$  of  $\frac{1}{140}$  of  $\frac{1}{2}$  =  $\frac{1}{5600}$ , cost of transporting 1 cwt. for 1 mile ;  $\frac{1}{5600} \times 120 \times 50 = \$12.00$  *Ans.*

$$\frac{\frac{1}{150}}{\frac{3}{10}} \text{ of } \frac{\frac{1}{140}}{\frac{10}{1}} \text{ of } \frac{\frac{12}{1}}{\frac{1}{1}} \times \frac{\frac{120}{1}}{\frac{1}{1}} \times \frac{\frac{50}{1}}{\frac{1}{1}} = \$12$$

(48)

50 oranges =  $\frac{50}{70}$  of 84 lemons = 60 lemons ;

60 lemons are worth  $2 \times 60 = 120$  cents = value of 1 lb. tea. *Ans.*

$$\frac{\frac{12}{70}}{\frac{50}{1}} \times \frac{\frac{50}{1}}{\frac{1}{1}} \times \frac{\frac{2}{1}}{\frac{1}{1}} = 120 \text{ cents} = \$1.20$$

(49)

$\$1.18\frac{2}{3}$ , amount of \$1 for 2 yr. 8 mo. at 7 per cent. ;

$\$500 \div 1.18\frac{2}{3} = \$421.348+$ , present value ;

$500 - 421.348 = \$78.652+$ , discount. *Ans.*



(50)

The interest on \$1 for  $4\frac{1}{2}$  years is  $\frac{1}{225}$  of  $91.12\frac{1}{2}$ , and for 1 year,  $\frac{1}{45}$  of  $\frac{1}{225}$  of  $91.12\frac{1}{2}$  =

$\frac{2}{9}$  of  $\frac{1}{225}$  of  $\frac{20.25}{2}$  =  $\frac{182.25}{100}$ ; and on \$640, for  $2\frac{1}{4}$  yr., it will be

$$\frac{9}{100} \times \frac{32}{1} \times \frac{9}{4} = \$129.60 \text{ Ans.}$$

$$\frac{2}{9} \text{ of } \frac{1}{225} \text{ of } \frac{182.25}{2} \times \frac{640}{1} \times \frac{9}{4} = \$129.60$$

(51)

$1000 \times 1.75 = \$1750$ , cash value;  $1000 \times 1.80 = \$1800$ , time value; the amount of \$1750 for 90 days, at 7 per cent., would be \$1780.625;  $1800 - 1780.625 = \$19.375$ . Most advantageous to sell on time.

(52)

$$1575 \div 1.045 = \$1507.177+, \text{ cash cost of goods;} \\ 1800 - 1507.177 = \$292.823, \text{ gain. Ans.}$$

(53)

Let 1 represent C's, then  $\frac{5}{6}$  would equal B's, and  $\frac{3}{4}$  of  $\frac{5}{6} = \frac{5}{8}$  would equal A's;  $1 + \frac{5}{8} + \frac{5}{8} = \frac{24}{24} + \frac{20}{24} + \frac{15}{24} = \frac{59}{24}$ , therefore they are all to have 59 shares, of which A is to have 15, B 20, and C 24;  $\$482.62 \div 59 = \$8.18$ ;  $8.18 \times 15 = \$122.70$  A's;  $8.18 \times 20 = \$163.60$  B's;  $8.18 \times 24 = \$196.32$  C's.

(54)

$$\frac{1}{4} + \frac{1}{8} = \frac{3}{8}, \text{ what A and B had;} 1 - \frac{3}{8} = \frac{5}{8} \text{ remainder,}$$

what C and D had ; now if C had 5 as often as D 6, then C had  $\frac{5}{11}$  and D  $\frac{6}{11}$  of  $\frac{1}{2}$ , which gives C  $\frac{1}{4}$  and D  $\frac{3}{10}$  of the whole. Then A must have  $\frac{1}{4}$ , B  $\frac{1}{5}$ , C  $\frac{1}{4}$ , and D  $\frac{3}{10}$  of \$9268.60 = \$2317.15 A's ; \$1853.72 B's ; \$2317.15 C's ; \$2780.58 D's.

( 55 )

$5 + 5 + 7 + 8 = 25$  parts all would pay ; therefore, A paid  $\frac{5}{25}$  of \$475.50 = \$95.10 ; B  $\frac{5}{25} = $95.10 ; C  $\frac{7}{25} = $133.14,$  and D  $\frac{8}{25} = $152.16.$$

( 56 )

$1000 \times 16 \times 35 = 560000$  ounces, whole amount of bread ;  
 $1000 + 400 = 1400$  men ;  $560000 \div 1400 = 400$  ounces for  
 1 man 56 days ;  $400 \div 56 = 7\frac{1}{7}$  ounces per day.

( 57 )

The first will fill  $\frac{1}{10}$  of it in 1 day ; the second  $\frac{1}{8}$  in 1 day ;  
 the third will empty  $\frac{1}{20}$  of it in 1 day ;  $\frac{1}{10} + \frac{1}{8} = \frac{13}{80}$  that  
 both will fill in 1 day ;  $\frac{13}{80} - \frac{1}{20} = \frac{9}{80}$ , what will remain in ;  
 $1 \div \frac{9}{80} = 8\frac{8}{9}$  days to fill it.

( 58 )

$536 \div 2 = 268$  yards distance between them ;  $34 \div 3 = 11\frac{1}{3}$   
 yards, the distance B goes in a minute ;  $11\frac{1}{3} - 11 = \frac{1}{3}$  yards  
 what B gains upon A in 1 minute. It will take him as many  
 minutes to gain 268 yards, or to overtake A, as  $\frac{1}{3}$  is contained  
 times in 268, which will be 804 minutes, and as he travels  $11\frac{1}{3}$   
 yards per minute, in 804 minutes he will travel 804 times  
 $11\frac{1}{3} = 9112$  yards ;  $9112 \div 536 = 17$  times around the  
 wood.

(59)

One man can do  $\frac{1}{10}$  of the work in 1 day, the other  $\frac{1}{8}$ , and the boy  $\frac{1}{20}$ ;  $\frac{1}{10} + \frac{1}{8} + \frac{1}{20} = \frac{17}{80}$ , and it will take them as many days to do the whole as  $\frac{17}{80}$  is contained times in 1;  $1 \div \frac{17}{80} = 4\frac{12}{17}$  days.

(60)

\$150 for 3 months =  $150 \times 3 = \$450$  for 1 month;

175 " 6 " =  $175 \times 6 = 1050$  " 1 "

175 " 8 " =  $175 \times 8 = 1400$  " 1 "

\$500 for various months = \$2900 for 1 month;

\$500 will require, in order to give the same interest that \$2900 gives in one month, as many months as 500 is contained times in 2900;  $2900 \div 500 = 5$  mo. 24 days. *Ans.*

(61)

$98\frac{3}{4} \times 7\frac{1}{2} \times 2\frac{1}{2} = \frac{395}{4} \times \frac{15}{2} \times \frac{5}{2} =$  solidity of wall in cu. ft.;  
 $\frac{1}{12}$  of  $\frac{1}{270}$  of  $\frac{2}{17}$  of  $\frac{395}{4} \times \frac{15}{2} \times \frac{5}{2} = \frac{1975}{102816}$  cu. ft. = work done by 1 man in 1 hr.;

$\frac{1975}{102816} \times 63 \times \frac{34}{3} = \frac{1975}{144} =$  work done by 63 men in 1 day of  $11\frac{1}{2}$  hr.;

$45\frac{1}{3} \times 6\frac{7}{12} \times 3\frac{1}{8} = \frac{136}{3} \times \frac{79}{12} \times \frac{25}{8} =$  solidity of 2d wall;

$\frac{136}{3} \times \frac{79}{12} \times \frac{25}{8} \div \frac{1975}{144} = \frac{136}{3} \times \frac{79}{12} \times \frac{25}{8} \times \frac{144}{1975} = 68$  da.  
2      79

(62)

$\frac{1}{2}$  cask =  $\frac{1}{3}$  cask + 21 gal.; hence, the difference between  $\frac{1}{2}$  and  $\frac{1}{3} = \frac{1}{6}$  cask = 21 gal.; and the cask contains 6 times 21 gal. = 126 gal. *Ans.*

(63)

In this example, the simple question is, did the investment

in stocks produce a larger or smaller rate of interest than 7 per cent.: and what was the difference in the amounts?

<i>Stock.</i>	<i>Dr.</i>
Sept. 1, 1854, 10 shares, at \$115 per share,.....	\$1150
Interest on \$1150 to Jan. 1, 1856, 16 mo. ....	107.333
Nov. 1, 1854, 8 shares, at \$98 per share,.....	784.000
Interest on \$784 to Jan. 1, 1856, 14 mo. ....	64.026
April 1, 1855, 5 shares, at \$98 per share,.....	490.000
Interest on \$490 to Jan. 1, 1856, 9 mo. ....	25.725
Cost of stock with interest, Jan. 1, 1856, ....	<u>\$2621.084</u>

<i>Stock.</i>	<i>Cr.</i>
Feb. 1, 1855, dividend on 18 shares,.....	\$72.00
Interest on \$72 to Jan. 1, 1856, 11 mo. ....	4.62
Aug. 1, 1855, dividend on 23 shares,.....	92.00
Interest on \$92 to Jan. 1, 1856, 5 mo. ....	2.684
Proceeds of 23 shares of stock, at \$99,.....	<u>\$2277.000</u>
Proceeds of stock,.....	<u>\$2448.304</u>

$\$2621.084 - \$2448.304 = \$172.780$ , loss by investment in stock.

( 64 )

He receives 91 cents on a dollar, after deducting for taxes and repairs ; therefore, \$3014.30 must be 91 per cent. of what he first receives ;  $3014.30 \div 91 = \$3312.417+$ . *Ans.*

( 65 )

$\$16.50 \div 165 = .10$  cents, the cost per pound ;  $36 \times .10 = \$3.60$ , the cost of 36 pounds ;  $390 \times .10 = \$39$ , what he must sell 390 pounds for to get the cost ;  $\$39 + 3.60 = \$42.60$ , what he must sell it for to gain the price of 36 pounds.

( 66 )

$\$406 \div 10 = 40.6$  cubic yards = the volume ; the volume of a body, divided by the product of any two of its dimensions, will give the third ;  $(40.6 \div 14.5) \div .7 = 4$  yd. the height.

( 67 )

$7 - 5 = 2$  miles, what he gains in 1 hour ; it will take him as many hours to gain 40 miles as 2 is contained times in  $40 = 20$  hours ;  $20 \times 7 = 140$  miles that he must travel.

( 68 )

The first family was equivalent to  $4\frac{1}{2}$  grown persons, and the second to 9 ;  $4\frac{1}{2}$  persons, in 2 weeks, would consume as much as 1 person in 9 weeks, and 9 persons, in 3 weeks, as much as 1 person in 27 weeks ; both families would consume the same as 1 person in 36 weeks ; therefore, the first must pay  $\frac{9}{36} = \frac{1}{4}$  of  $\$8 = \$2$  ; the second,  $\frac{27}{36} = \frac{3}{4}$  of  $\$8 = \$6$ .

( 69 )

33 A. 2 R. 16 P. = 33.6 A. ;  $33.6 \times 125 = \$4200$ , value of the land ;  $4200 \div 42 = 100$  thousand feet of lumber.

( 70 )

$150 \div .03\frac{3}{4} = \$4000$ , amount insured, including the premium ;  $150 + 25 = \$175$  ;  $4000 - 175 = \$3825$  Ans.

( 71 )

$.96 \times 5000 = \$4800$ , cash value of the rye ;  
 $1 \times 5000 = \$5000$ , credit value ; the amount of  $\$4800$  for 2 months, at 7 per cent., is  $\$4856$  ;  $5000 - 4856 = \$144$ , in favor of cash. Ans.

(72)

As he sold  $\frac{1}{6}$  at par, he must have sold  $\frac{5}{6}$  of  $\frac{2}{3} = \frac{5}{9}$ , capital, for \$25000;  $25000 - 5000 = 20000$ , par value of  $\frac{5}{9}$  capital;  $20000 \div \frac{5}{9} = 20000 \times \frac{9}{5} = \$36000$ , capital. *Ans.*

(73)

3 ft. 5 in. = 41 in.; 2 ft. 6 in. = 30 in.; 6 ft. = 72 in.;  $41 \times 30 \times 72 = 88560$  cubic inches = the volume of the bin; 88560, divided by 2150.4, the number of cubic inches in a bushel, gives 41.183+ bushels.

(74)

It will take the first 72 days to travel 2160 miles; the second, 80 days; and the third, 90 days; therefore, the third must start first; the second, 10 days after him; and the first 8 days after the second, or 18 days after the third.

(75)

The house did not give a profit of \$420 by \$130;  $420 - 130 = \$290$ , actual profit;  $7180 - 290 = \$6890$ , the purchase price.

(76)

The two companies consisted of 47 men; hence, the first cleared  $\frac{25}{47}$ , and the second  $\frac{22}{47}$  of 188 acres; or the first cleared 100 acres, and the second 88 acres; as the first company contained 3 more men than the second, \$84 must be the wages of the 3 men;  $\frac{1}{3}$  of 84 = \$28 = wages of 1 man;  $28 \times 47 = \$1316$  = whole cost;  $1316 \div 188 = \$7$  per acre. *A.*

(77)

Due Feb. 12,	.	.	.	.	.	\$100	$\times$	42	=	4200
" March 12,	.	.	.	.	.	400	$\times$	70	=	28000
" April 1,	.	.	.	.	.	300	$\times$	90	=	27000
						800				59200

$59200 \div 800 = 74$  days from Jan. 1; or, March 16.

(78)

$32 \times 25 \times 144 = 115200$  sq. in., area of the floor;  $15 \times 15 = 225$  sq. in., area of a slab;  $115200 \div 225 = 512$  slabs;  $(32 \times 25) \div 9 = 88\frac{8}{9}$  sq. yd., area of floor;  $88\frac{8}{9} \times 3.40 = \$302.22\frac{2}{3}$ , whole cost.

(79)

$500 + 425 + 300 + 250 \times 175 = \$1650$ , amount of bequests.

$1650 : 500 :: 1155 : x = \$350$  A's.

$1650 : 425 :: 1155 : x = \$297.50$  B's.

$1650 : 300 :: 1155 : x = \$210$  C's.

$1650 : 250 :: 1155 : x = \$175$  D's.

$1650 : 175 :: 1155 : x = \$122.50$  E's.

(80)

1 lb. tea =  $\frac{7}{3}$  lb. of coffee; 1 lb. coffee =  $\frac{4\frac{8}{9}}{14}$  lb. sugar; 1 lb.

sug. =  $2\frac{7}{8}$  lb. soap; 1 lb. tea =  $\frac{7}{3}$  of  $\frac{12}{14}$  of  $\frac{27}{18}$  lb. of soap = 12

lb.;  $12 \times 6 = 72$  lb. soap. *Ans.*

(81)

Let 1 or  $\frac{5}{5}$  represent the time to midnight, then  $\frac{4}{5}$  will represent the time past noon, and  $\frac{5}{5} + \frac{4}{5} = \frac{9}{5}$  the whole time from noon to midnight; if 12 hours be  $\frac{9}{5}$ ,  $\frac{1}{9}$  of 12 hours would be  $\frac{1}{5} = \frac{1}{9}$  of 12 =  $1\frac{1}{3}$  hours,  $\frac{4}{5}$  of the time past noon would be 4 times  $1\frac{1}{3}$  hr. =  $5\frac{1}{3}$  hr. = 5 o'clock and 20 minutes, P. M.

(82)

$\frac{2}{5} \div \frac{3}{4} = \frac{2}{5} \times \frac{4}{3} = \$\frac{8}{15}$  = cost of 1 yd., that is,  $\frac{7}{8}$  yd. wide;  $\frac{8}{15} \div \frac{7}{8} = \$\frac{64}{105}$  = cost of 1 yd. of the yard-wide cloth;  $\frac{64}{105} \times \frac{7}{4} = \frac{16}{15} = \$1\frac{1}{3}$  = cost of 1 yd., that is,  $1\frac{3}{4}$  yd. wide;  $\frac{5}{8}$  of  $\frac{16}{15} = \$\frac{2}{3} = \$0.66\frac{2}{3}$ . *Ans.*

$$\frac{2}{5} \div \frac{3}{4} \div \frac{7}{8} \times \frac{7}{4} \times \frac{5}{8} = \frac{2}{5} \times \frac{4}{3} \times \frac{8}{7} \times \frac{7}{4} \times \frac{5}{8} = \frac{2}{3}$$

( 83 )

If he had bought all turkeys, they would have cost him \$66 ; but as he paid only \$51.60, he saved \$14.40 by buying a part chickens ; and as he would save the difference between \$1.10 and 50 cents in buying 1 chicken, so he must buy as many chickens as 60 cents is contained times in \$14.40 = 24 chickens ;  $60 - 24 = 36$  turkeys.

( 84 )

$6 + 4 + 3 = 13$  shillings, what he paid to them for 1 day's work ; for 104 shillings he could employ them as many days as 13 is contained times in  $104 = 8$  days. *Ans.*

( 85 )

$5 + 6 + 7 = \$18$  ; then the first must have  $\frac{5}{18}$ , the second  $\frac{6}{18}$ , and the third  $\frac{7}{18}$  of \$6471 : hence, \$1797.50, the first ; \$2157, the second ; and \$2516.50, the third.

( 86 )

$1600 + 300 = \$1900$ , whole stock and gain. Now, the gain of the first will bear the same relation to the whole gain as his stock and gain do to the whole stock and gain—or  $1900 : 1140 :: 300 : x = \$180$ , the gain of the first ;  $1140 - 180 = \$960$ , the stock of the first ;  $1600 - 960 = \$640$ , the stock of the second ; and  $300 - 180 = \$120$ , the gain of the second.

( 87 )

4.55 ft. : 75.75 ft. :: 3 ft. :  $x$  ft. = 49.945 + ft. *Ans.*

( 88 )

A can do  $\frac{1}{3}$  of the work in 1 week ; if B can do 3 times as



much in 8 weeks, he can do A's work in  $\frac{8}{3}$  of a week, and in 1 week  $\frac{3}{8}$  of it ; if C can do 5 times as much in 12 weeks, he can do A's work in  $\frac{12}{5}$  of a week, and in 1 week  $\frac{5}{12}$  of it ;  $\frac{1}{3} + \frac{3}{8} + \frac{5}{12} = \frac{27}{24} = \frac{9}{8}$  what all will do in 1 week ; since they can do  $\frac{9}{8}$  of the work in 1 week, they will do  $\frac{1}{8}$  of the work in  $\frac{1}{9}$  of 1 week, and to do the whole or  $\frac{8}{8}$  will require 8 times  $\frac{1}{9}$  of 1 week =  $\frac{8}{9}$  of a week. *Ans.*

( 89 )

$11\frac{1}{2} \times 4 = 46$  mi. ; the first is 46 mi. in advance when the second passes the point ;  $17\frac{1}{2} - 11\frac{1}{2} = 6$  miles, the second gains upon the first in 1 hour ; it will require as many hours to overtake him as 6 is contained times in  $46 = 7\frac{2}{3}$  hours ;  $7\frac{2}{3} + 4 = 11\frac{2}{3}$  hours, the first will travel ;  $11\frac{1}{2} \times 11\frac{2}{3} = 134\frac{1}{2}$  miles, the distance the first will travel.

( 90 )

\$120 = A's gain for 6 mo. ;  $120 \div 6 = \$20$ , A's gain for 1 mo.  
 \$400 = B's gain for 12 mo. ;  $400 \div 12 = 833\frac{1}{3}$ , B's gain for 1 mo.  
 \$100 = C's gain for 15 mo. ;  $100 \div 15 = \$6\frac{2}{3}$ , C's gain for 1 mo.

$\$20 + \$33\frac{1}{3} + \$6\frac{2}{3} = \$60$ , entire gain for 1 month.

Now, since we have the whole gain, and the gain of each, *for the same time* ; we have

$$60 : 20 :: 1600 : x = \$533\frac{1}{3} \text{ A's.}$$

$$60 : 33\frac{1}{3} :: 1600 : x = \$888\frac{8}{9} \text{ B's.}$$

$$60 : 6\frac{2}{3} :: 1600 : x = \$177\frac{7}{9} \text{ C's.}$$

$$\text{Proof, } 533\frac{1}{3} + 888\frac{8}{9} + 177\frac{7}{9} = \$1600.$$

( 91 )

First find the number of days, that it will take each to travel around it, by dividing the circumference by the number of miles each travels per day ; it would take A  $12\frac{1}{4}$ , B  $7\frac{3}{10}$ , and C  $4\frac{9}{10}$

days ; find the least common multiple of these three numbers ; thus,

$$12\frac{1}{6} \dots 7\frac{3}{10} \dots 4\frac{9}{16} = \frac{73}{240}) \frac{73}{6} \dots \frac{73}{10} \dots \frac{73}{16}$$

$$\begin{array}{r} 5) 40 \dots 24 \dots 15 \\ 3) 8 \dots 24 \dots 3 \\ 2) 8 \dots 8 \dots 1 \\ 2) 4 \dots 4 \dots 1 \\ 2) 2 \dots 2 \dots 1 \\ 1 \dots 1 \dots 1 \end{array}$$

$$\frac{73}{240} \times 5 \times 3 \times 2 \times 2 \times 2 \times \frac{73}{2} =$$

$$36\frac{1}{2} \text{ Ans.}$$

( 92 )

$(2)^3 \times 1728 = 13824$  cu. in., volume of the cube ; 13824 less 10 per cent. = 12441.6 cu. in., to be drawn into wire ;  $(\frac{1}{8})^2 \times 7854 = .012272$ , area of the base of the cylinder of wire ;  $12441.06 \div .012272 = 1013820.078 +$  inches, length of wire = 84485.006 feet.

( 93 )

\$10000 at 6 per cent. yields \$600. Sold out at 65 per cent., giving \$6500 : this, invested at  $82\frac{1}{2}$  per cent., gives  $6500 \div .825 = \$7878.787$ , the interest on which, at 5 per cent., is \$393.939 ; hence, the difference, \$206.061, is in favor of the first investment.

( 94 )

$46\frac{1}{2} \times 8 \times 2\frac{3}{5} = 967.2$  cu. yd., what would take one boat through ;  $365 - (52 + 8) = 305$  days in the year ;  $40 + 40 = 80$  boats per day ;  $967.2 \times 80 \times 305 = 23599680$  cu. yd. *A.*

( 95 )

$365 \times 22 \times 64 = \$513920$ , whole amount of tolls ;  $22 \times 5 \times 66 = \$7260$ , expenses ;  $513920 - 7260 = \$506660$ , whole tolls ;  $506660 - 200000 = 306660$  ;  $306660 \div 66 = \$4646.363$ .

( 96 )

$$\begin{array}{r} 60 \times 48 = 2880 \\ 800 \times 43 = 34400 \\ \hline 37280 \text{ 1st.} \end{array}$$

$$\begin{array}{r} 600 \times 48 = 28800 \\ 1800 \times 42 = 75600 \\ \hline 104400 \text{ 2d.} \end{array}$$

$$\begin{array}{r} 400 \times 48 = 19200 \\ 500 \times 42 = 21000 \\ 500 \times 36 = 18000 \\ 500 \times 30 = 15000 \\ 500 \times 24 = 12000 \\ 500 \times 18 = 9000 \\ 500 \times 12 = 6000 \\ 500 \times 6 = 3000 \\ \hline 103200 \text{ 3d.} \end{array}$$

$$\begin{array}{r} 900 \times 40 = 36000 \\ 900 \times 34 = 30600 \\ 900 \times 28 = 25200 \\ 900 \times 22 = 19800 \\ 900 \times 16 = 14400 \\ 900 \times 10 = 9000 \\ 900 \times 4 = 3600 \\ \hline 138600 \text{ 4th.} \end{array}$$

$$\begin{array}{r} 800 \times 48 = 38400 \\ 800 \times 36 = 28800 \\ 800 \times 24 = 19200 \\ 800 \times 12 = 9600 \\ \hline 96000 \text{ 5th.} \end{array}$$

$$\begin{array}{r} 37280 \\ 104400 \\ 103200 \\ 138600 \\ 96090 \\ \hline 479480 \text{ whole stock.} \end{array}$$

$$479480 : 37280 :: 20000 : x = \$1555.017 + \text{ 1st.}$$

$$479480 : 104400 :: 20000 : x = \$4354.717 + \text{ 2d.}$$

$$479480 : 103200 :: 20000 : x = \$4304.663 + \text{ 3d.}$$

$$479480 : 138600 :: 20000 : x = \$5781.263 + \text{ 4th.}$$

$$479480 : 96000 :: 20000 : x = \$4004.338 + \text{ 5th.}$$

( 97 )

44 + 49 = 93, the number of men it would require to increase the square by 1 man on a side; deducting 1 for the man occupying the corner, and dividing by 2, we have the number of men on one side of the square;  $(93 - 1) \div 2 = 46$ ;  $(46)^2 = 2116$  = the number of men in the square first formed;  $2116 + 44 = 2160$  men in the army.

( 98 )

$\frac{1}{3} + \frac{1}{4} + \frac{1}{5} = \frac{20}{60} + \frac{15}{60} + \frac{12}{60} = \frac{47}{60}$ ; if \$987 were divided into 47 parts, A would have 20; B, 15; and C, 12 of them, or  $\frac{20}{47}$ ,  $\frac{15}{47}$ , and  $\frac{12}{47}$  of \$987; by C's death, the whole is to be divided proportionally between A and B;  $\frac{20}{47} + \frac{15}{47} = \frac{35}{47} = 35$  parts, of which A must have 20 and B 15; or  $A \frac{20}{35} = \frac{4}{7}$ , and  $B, \frac{15}{35} = \frac{3}{7}$  of \$987;  $\frac{4}{7}$  of 987 = \$564, A's share;  $\frac{3}{7}$  of 987 = \$423, B's share. *Ans.*

( 99 ,

When she left the last place she had \$3, which was  $\frac{1}{2}$  a dollar less than  $\frac{1}{2}$  she had when she came to the last place; then,  $3\frac{1}{2}$  is one-half of 2 times  $3\frac{1}{2} = \$7$ , what she had when she left the second place, which was  $\frac{1}{2}$  a dollar less than  $\frac{1}{2}$  she had when she came to the second place; then  $7\frac{1}{2}$  is one-half of 2 times  $7\frac{1}{2} = \$15$ , what she had when she left the first place, which was  $\frac{1}{2}$  a dollar less than  $\frac{1}{2}$  she had when she came to the first place; then  $15\frac{1}{2}$  is one-half 2 times  $15\frac{1}{2} = \$31$ , what she started with.

( 100 )

Let 1 denote the quantity of fluid discharged by the first pipe in 4 hours, then  $\frac{1}{4}$  will be the quantity discharged in 1 hour; but the quantities discharged are as the areas of their sections, and therefore as the squares of their diameters; hence,

$$6^2 : 3^2 :: \frac{1}{4} : x = \frac{1}{16},$$

what 1 of the smaller pipes will discharge in 1 hour; 4 pipes will discharge 4 times as much =  $\frac{1}{4}$ ; therefore the 4 smaller pipes will discharge as much in 1 hour as the larger; and to discharge 2 times as much in 4 hours, would require  $4 \times 2 = 8$  hours. *Ans.*

(101)

$$(370 - 40) \div (12 - 1) = \$30, \text{ common difference ;}$$

$$(370 + 40) \times 6 = \$2460, \text{ whole cost.}$$

(102)

$$15000 \div 3 = \$5000, \text{ equal payment ;}$$

$$5000 \div 1.02\frac{1}{2} = \$4885.9934 + \text{ present value ;}$$

$$5000 \div 1.035 = \$4830.9178 + \quad \text{ " } \quad \text{ "}$$

$$5000 = 1.0525 = \underline{\$4750.5938} + \quad \text{ " } \quad \text{ "}$$

$$\underline{\$14467.505} \text{ present value of purchase.}$$

(103)

$$\left. \begin{array}{r} 60 \\ 2\frac{1}{2} \\ 1\frac{1}{4} \end{array} \right\} : \left. \begin{array}{r} 84 \\ 3 \\ 2\frac{1}{2} \end{array} \right\} :: 45 : x = 97\frac{1}{2} \text{ lb.}$$

$$\frac{\cancel{48}}{1} \times \frac{\cancel{12}}{1} \times \frac{3}{1} \times \frac{9}{\cancel{4}} \times \frac{1}{\cancel{60}} \times \frac{2}{5} \times \frac{\cancel{4}}{\cancel{7}} = 97\frac{1}{2}$$

(104)

The eggs cost  $\frac{1}{2}$  of a cent each, and were sold for  $\frac{3}{4}$  of a cent each ;  $\frac{3}{4} - \frac{1}{2} = \frac{1}{4}$ , the gain on 1 egg ;  $4 \div \frac{1}{4} = 80$  eggs, the number sold.

(105)

$\frac{1}{8} + \frac{1}{12} + \frac{1}{7} + \frac{1}{2} + 5 + 4$  must equal the whole length of life ;  $\frac{1}{8} + \frac{1}{12} + \frac{1}{7} + \frac{1}{2} = \frac{75}{84}$ , then 9 years must make up the whole ;  $1 - \frac{75}{84} = \frac{9}{84}$ , or the nine years of his life, from which we readily find his age to be 84 years.

(106)

Find the volumes of two cylinders, each 40 feet in length,

and one 6 ft. 6 in. in diameter, and the other 3 ft. 6 in.; the difference in volume will be the contents of the wall.

$$(42)^2 \times .7854 = 1385.4456 \text{ sq. in., area of base ;}$$

$$1385.4456 \times 480 = 665013.888 + \text{cu. in.} = 384.846 \text{ cu. ft.} = \\ \text{contents of small cylinder ; } (78)^2 \times .7854 \times 480 = \\ 2293619.3280 \text{ cu. in.} = 1327.326 \text{ cu. ft.} = \text{contents of large} \\ \text{cylinder ;}$$

$$1327.326 - 384.846 = 942.48 \text{ cu. ft., contents of wall.}$$

( 107 )

$$100 \text{ links} = 1 \text{ chain ; } 16 \text{ links} = \frac{16}{100} \text{ chain ;}$$

$$42.16 \times 37 = 1559.92 \text{ sq. ch.} = 155.992 \text{ acres} =$$

$$155 \text{ A. } 3 \text{ R. } 38.72 \text{ P. } \textit{Ans.}$$

( 108 )

Each annual payment is made up of two parts—interest and principal. The payment, at the end of the first year, consists of the interest on \$1500, and a certain portion of the principal, which we will call an instalment. The second annnal payment consists of the interest on the diminished principal, and a second instalment. Now, the interest on \$1500, for 1 year, plus the first instalment, is equal to the second year's interest, plus the second instalment, since each is equal to an annual payment. But the second year's interest is less than the first, by the interest on the first instalment ; therefore, the second instalment exceeds the first by this interest ; or by the .07 part ; hence, the second instalment is equal to 1.07 times the first. In the same way, it may be shown, that the third is equal to the second taken 1.07 times ; or equal to the first taken  $1.07 \times 1.07$  times : and the same for the other instalments. Hence, the instalments form a geometrical pro-

gression, of which the first term is the first instalment, the ratio 1.07, the number of terms 5, and the sum of the series 1500: the first term is required:

$$\text{1st term} = \frac{150 \times .07}{1.07^5 - 1} = 260.837 = \text{first instalment};$$

$$\$1500 \times .07 = \$105, \text{ first annual interest};$$

$$\$105 + 260.837 = \$365.837, \text{ annual payment.}$$

(109)

A, B, C will fill  $\frac{1}{6}$  in 1 hour; B, C, D,  $\frac{1}{8}$ ; C, D, A,  $\frac{1}{10}$ ; and D, A, B,  $\frac{1}{12}$ ;  $\frac{1}{6} + \frac{1}{8} + \frac{1}{10} + \frac{1}{12} = \frac{57}{120}$ , and because the amount poured in by each pipe has been named 3 times, we divide  $\frac{57}{120}$  by 3 =  $\frac{19}{40}$ , what the 4 pipes will fill in 1 hour; E, F, G will empty  $\frac{1}{6}$  in 1 hour; F, G, H,  $\frac{1}{8}$ ; G, H, E,  $\frac{1}{10}$ ; and H, E, F,  $\frac{1}{12}$ ;  $\frac{1}{6} + \frac{1}{8} + \frac{1}{10} + \frac{1}{12} = \frac{57}{120}$ , and because the amount each pipe empties is named 3 times, we divide  $\frac{57}{120}$  by 3 =  $\frac{19}{40}$ , what the four pipes will empty in 1 hour;  $\frac{19}{40} - \frac{19}{40} = \frac{19}{120}$  of the whole fountain will be emptied in 1 hour; it will take as many hours to empty the fountain as  $\frac{19}{120}$  is contained times in 1, which is  $6\frac{6}{19}$  hours.

(110)

Since the weight of similar bodies are in the same ratio as their volumes, and therefore as the cubes of their diameters, hence,

$$5 : 78.125 :: 2^3 : x^3 = 125; \sqrt[3]{125} = 5 \text{ inches.}$$

(111)

The divisors, which give "the present value," are what one dollar, placed at compound interest (the interest being added semi-annually), would produce from April 1st, 1853, to the times of the several payments.

Payment April 1st, 1853, without interest,	\$500.00
“ “ 1st, 1852, with 1 year's interest,	535.00
Present value of payment for 1854	= 466.75 +
“ “ “ 1855	= 435.72 +
“ “ “ 1856	= 406.75 +
“ “ “ 1857	= 379.71 +
“ “ “ 1858	= 354.47 +
“ “ “ 1859	= 330.90 +
“ “ “ 1860	= 308.89 +
“ “ “ 1861	= <u>288.35 +</u>

Present value of the bond on the 1st of April, 1863 \$4006.54 +

## MENSURATION.

(2)

$$(60 \times 12) \div 2 = 360 \text{ sq. ch.}; 360 \div 10 = 36 \text{ acres.}$$

(3)

$$(45 \times 38) \div 2 = 855 \text{ sq. rd.} = 5 \text{ A. } 1 \text{ R. } 15 \text{ P. } \textit{Ans.}$$

(4)

$$(75 \times 36) \div 2 = 1350 \text{ sq. ch.} = 135 \text{ acres.}$$

(1)

$$(66.16 \times 66.16) \div 10 = 437.71456 \text{ acres} = 437 \text{ A. } 2 \text{ R. } 34 + \text{ P.}$$

(2)

$$(54 \times 54) \div 10 = 291.6 \text{ acres} = 291 \text{ A. } 2 \text{ R. } 16 \text{ P. } \textit{Ans.}$$

(3)

$$75 \times 75 = 5625 \text{ sq. rd.} = 35 \text{ A. } 0 \text{ R. } 25 \text{ P. } \textit{Ans.}$$

(4)

$$80 \times 40 = 3200 \text{ sq. rd.} = 20 \text{ A. } \textit{Ans.}$$



(5)

$$80 \times 80 = 6400 \text{ sq. rd.} = 40 \text{ A. } \textit{Ans.}$$

(6)

$$(30 \times 5) \div 10 = 15 \text{ A. } \textit{Ans.}$$

(7)

$$54 \text{ ch.} \times 4 = 216 \text{ rd.}; 216 \times 18 = 3888 \text{ sq. rd.} = 24 \text{ A. } 1 \text{ R. } 8 \text{ P}$$

(8)

$$720 \text{ ft.} = 240 \text{ yd.}; 542 \times 240 = 130080 \text{ sq. yd.} = 26 \text{ A. } 3 \text{ R. } 20 \text{ P. } 5 \text{ sq. yd. } \textit{Ans.}$$

(9)

$$\text{Square measure} \div \text{length} = \text{breadth}; 24000 \div 200 = 120 \text{ ft.}$$

(2)

$$(24.82 + 16.44) \times 10.30 \div 2 = 21.2489 \text{ acres} = 21 \text{ A. } 0 \text{ R. } 39.824 \text{ P. } \textit{Ans.}$$

(3)

$$(51 + 37\frac{1}{2}) \times 20\frac{5}{8} \div 2 = 921.875 \text{ sq. ft. } \textit{Ans.}$$

(4)

$$(24.5 + 41) \times 21.5 \div 2 = 704.125 \text{ sq. yd. } \textit{Ans.}$$

(5)

$$(24.5 + 15) \times 30.80 \div 2 = 608.3 \text{ sq. ch.} = 60 \text{ A. } 3 \text{ R. } 12.8 \text{ P}$$

(6)

$$(40 + 64) \times 52 \div 2 = 2704 \text{ sq. ch.} = 270 \text{ A. } 1 \text{ R. } 24 \text{ P. } \textit{A.}$$

(2)

$$186 \times 3.1416 = 584.3376 \text{ } \textit{Ans.}$$

(3)

$$40 \times 3.1416 = 125.664 \text{ Ans.}$$

(4)

$$57 \times 3.1416 = 179.0712 \text{ Ans.}$$

(1)

$$157.08 \div 3.1416 = 50 \text{ Ans.}$$

(2)

$$23304.3888 \div 3.1416 = 7418 \text{ Ans.}$$

(3)

$$13700 \div 3.1416 = 4360.835+ \text{ Ans.}$$

(1)

$$(12)^2 \times .7854 = 113.0976 \text{ A.}$$

(2)

$$5^2 \times .7854 = 19.635 \text{ A.}$$

(3)

$$(14)^2 \times .7854 = 153.9384 \text{ Ans.}$$

(4)

$$(3.5)^2 \times .7854 \div 9 = 1.069016+ \text{ sq. yd. Ans.}$$

(5)

$$(\frac{1}{8})^2 \times .7854 = .031416 \text{ sq. mi.} = 20 \text{ A. } 0 \text{ R. } 16.9984 \text{ P.}$$

(1)

$$6^2 \times 3.1416 = 113.076 \text{ A.}$$

(2)

$$(14)^2 \times 3.1416 = 615.7536.$$

(3)

$$(36)^2 \times 3.1416 = 4071.5136.$$

(4)

$$(7918.7)^2 \times 3.1416 = 196996571.722104 \text{ sq. mi.}$$

(2)

$$(8^2 \times 3.1416 \times 8) \div 6 = 268.0832, \text{ volume. } \textit{Ans.}$$

(3)

$$((16)^2 \times 3.1416 \times 16) \div 6 = 2144.6656, \text{ volume. } \textit{Ans.}$$

(4)

$$((7918.7)^2 \times 3.1416 \times 7918.7) \div 6 = 259992792082.63749 +$$

(5)

$$((1.2)^2 \times 3.1416 \times 1.2) \div 6 = .9047808 \textit{ Ans.}$$

(1)

$$35 \times 5 \times 52 = 9100 \text{ sq. ft.}$$

(2)

$$15 \times 8 \times 12 = 1440 \text{ sq. ft.}$$

(2)

$$48 \times 48 \times 48 = 110591 \text{ cu. in. } \textit{Ans.}$$

(3)

$$3 \text{ ft. } 2 \text{ in.} \times 2 \text{ ft. } 8 \text{ in.} \times 5 \text{ ft.} = 42\frac{2}{3} \text{ cu. ft. } \textit{Ans.}$$

(4)

$$1728 \times 42\frac{2}{3} = 72960 \text{ cu. in., volume of the cistern.}$$

$$72960 \div 231 = 315\frac{5}{7} \text{ gallons. } \textit{Ans.}$$

(5)

$$691 \times 20 = 13820 \text{ cu. ft. } \textit{Ans.}$$

(1)

$$20 \times 3.1416 \times 40 = 2513.28. \textit{ Ans.}$$

(2)

$$8\frac{1}{3} \times 3.1416 \times 28 = 233.33\frac{1}{3} \text{ sq. ft. } \textit{Ans.}$$

(3)

$$15 \times 8.1416 \times 60 = 2827.44 \text{ sq. in. } \textit{Ans.}$$

(4)

$$40 \times 8.1416 \times 50 = 6283.2 \text{ sq. ft. } \textit{Ans.}$$

(2)

$$(40)^2 \times .7854 \times 29 = 36442.56 \text{ } \textit{Ans.}$$

(3)

$$(24)^2 \times .7854 \times 30 = 13571.712 \text{ } \textit{Ans.}$$

(4)

$$(32)^2 \times .7854 \times 12 = 9650.9952 \text{ } \textit{Ans.}$$

(5)

$$(25)^2 \times .7854 \times 15 = 7363.125 \text{ } \textit{Ans.}$$

(2)

$$(365 \times 36) \div 3 = 4380 \text{ } \textit{Ans.}$$

(3)

$$(207 \times 36) \div 3 = 2484 \text{ } \textit{Ans.}$$

(4)

$$(562 \times 30) \div 3 = 5620 \text{ } \textit{Ans.}$$

(5)

$$(540 \times 32) \div 3 = 5760 \text{ } \textit{Ans.}$$

(6)

$$(50 \times 24 \times 36) \div 3 = 14400 \text{ } \textit{Ans.}$$

(7)

$$(15 \times 15 \times 24) \div 3 = 1800 \text{ Ans.}$$

(2)

$$((36)^2 \times .7854 \times 27) \div 3 = 9160.9056 \text{ Ans.}$$

(3)

$$((35)^2 \times .7854 \times 27) \div 3 = 8659.035 \text{ Ans.}$$

(4)

$$((20)^2 \times .7854 \times 27) \div 3 = 2827.44 \text{ Ans.}$$

## GAUGING.

(2)

$$26 \div 38 = .68\frac{8}{19}; 8551 \times 38 = 32.4938 \text{ in., mean diameter.}$$

(3)

$$22 \div 34 = 64\frac{12}{17}; 8311 \times 34 = 28.2574 \text{ in., mean diameter.}$$

(1)

$$30 \div 36 = 83\frac{1}{3}; .9467 \times 36 = 34.0812;$$

$$(34.0812)^2 \times 50 \times 34 = 197.459 + \text{gallons of wine.}$$

(2)

$$30 \div 35 = 85.7; .9556 \times 36 = 33.446, \text{ mean diameter;}$$

$$(33.446)^2 \times 36 \times 34 = 136.9209 + \text{gallons of wine;}$$

$$(33.446)^2 \times 36 \times 28 = 112.7583 + \text{gallons of beer.}$$

(3)

$$24 \div 36 = 66\frac{2}{3}; .8954 \times 36 = 32.234, \text{ mean diameter;}$$

$$(32.234)^2 \times 42 \times 34 = 148.3772 + \text{gallons of wine.}$$

## MECHANICAL POWERS.

(1)

$$1 : 1 :: 40 : x = 40 \text{ pounds. } Ans.$$

(2)

The distance from the power to the fulcrum is 2 times that of the weight.

$$2 : 1 :: 50 : x = 25 \text{ pounds. } Ans.$$

(3)

$$1 : 2 :: 25 : x = 50 \text{ pounds. } Ans.$$

(4)

$$6 : 2 :: 60 : x = 20 \text{ pounds. } Ans.$$

(5)

$$5 : 1 :: 200 : x = 40 \text{ pounds. } Ans.$$

(6)

$$1 : 1 :: 1 : x = 1 \text{ in. ; } 1 \times 1\frac{1}{2} = 1\frac{1}{2} \text{ in. ; } \\ 1 \times 2 = 2 \text{ in. ; } 1 \times 4 = 4 \text{ in. } Ans.$$

(7)

$$5 : 8 :: 40 : x = 64 \text{ pounds. } Ans.$$

(8)

$$8 : 12 :: 100 : x = 150 \text{ pounds. } Ans.$$

(1)

$$60 \div 1 = 60 \text{ lb. } Ans.$$

(2)

$$80 \div 2 = 40 \text{ lb. } Ans.$$

$$\begin{array}{cc} (3) & (1) \\ 100 \div 4 = 25 \text{ lb.} & 40 : 600 :: 6 : x = 90 \text{ in.} = 7\frac{1}{2} \text{ ft.} \end{array}$$

$$(2) \\ 400 : 100 :: 6 : x = 1\frac{1}{2} \text{ ft. } Ans.$$

$$(1) \\ 30 : 6 :: 200 : x = 40 \text{ pounds. } Ans.$$

$$(2) \\ 10 : 20 :: 50 : x = 100 \text{ pounds. } Ans.$$

$$(3) \\ 45 : 15 :: 180 : x = 60 \text{ pounds. } Ans.$$

$$(1) \\ 2 : 12 :: 96 : x = 576 \text{ pounds. } Ans.$$

$$(2) \\ 3 : 27 :: 250 : x = 2250 \text{ pounds. } Ans.$$

$$(3) \\ 4\frac{1}{2} : 24 :: 200 : x = 1066\frac{2}{3} \text{ lb. } Ans.$$

$$(4) \\ 5 : 30 :: 500 : x = 3000 \text{ } Ans.$$

$$(1) \\ \begin{array}{ccccccc} \text{in.} & \text{ft.} & \text{in.} & \text{lb.} & & & \text{lb.} \\ \frac{1}{2} : 15 = 180 :: 720 : x = 720 \times 180 \times 2 = 259200 \text{ } A. \end{array}$$

$$(2) \\ \begin{array}{l} 12 \text{ ft.} = \text{radius ; } 24 \text{ ft.} = \text{diameter ; } 24 \times 3.1416 \times 12 = \\ 904.7808 \text{ in.} = \text{circumference ;} \\ 904.7808 : \frac{1}{2} :: 2 \text{ tons} = 4000 \text{ lb.} : x = 1.47 + \text{ lb. } Ans. \end{array}$$

(3)

First get the power that will produce 10000 lb. effort by the wedge;  $30 : 2\frac{1}{2} :: 10000 : x = 833\frac{1}{3}$  lb. = to the weight sustained by the screw;  $3.1416 \times 20 \times 12 = 753.9840$  in., circumference;

$$753.9840 : 1 :: 833\frac{1}{3} : x = 1.15 + \text{lb. } Ans.$$

(4)

$$30 \times 3.1416 \times 12 = 1130.976, \text{ circumference;} \\ 282744 : 300 :: 1130.976 : x = 1.20 \text{ in. } Ans.$$

## QUESTIONS IN NATURAL PHILOSOPHY.

(1)

$$16\frac{1}{2} + (11 \times 32\frac{1}{2}) = 369\frac{1}{2} \text{ ft} = \text{space passed in 12th sec.;} \\ 16\frac{1}{2} \times (12)^2 = 16\frac{1}{2} \times 144 = 2316 \text{ ft.} = \text{whole space. } Ans.$$

(2)

$$16\frac{1}{2} \times (15)^2 = 16\frac{1}{2} \times 225 = 3618\frac{1}{2} \text{ ft.} = \text{space passed} \\ \text{through;} 32\frac{1}{2} \times 15 = 482\frac{1}{2} \text{ ft.} = \text{acquired velocity.}$$

(3)

$$(\text{Velocity})^2 = 2 \times 32\frac{1}{2} \times \text{height of fall} = (120)^2; \text{ hence,} \\ \text{height of fall} = (120)^2 \div 2 \times 32\frac{1}{2} =$$

$$\frac{120 \times 120 \times 3}{2 \times 193} = 223\frac{1}{2} \text{ ft. } Ans.$$

(4)

$$100 = 16\frac{1}{2} \times \text{square of time in seconds;} \\ \text{Number of seconds} = \sqrt{100 \div 16\frac{1}{2}} = \sqrt{\frac{100 \times 2}{33}} = \\ \sqrt{\frac{200}{33}} = \sqrt{6.0606} = 2.46 + \text{sec. } Ans.$$



(5)

$$16\frac{1}{2} \times (10)^2 = 16\frac{1}{2} \times 100 = 1608\frac{1}{2} \text{ ft.} = \text{the space ;}$$

$$32\frac{1}{2} \times 10 = 321\frac{1}{2} \text{ ft.} = \text{the velocity. } \textit{Ans.}$$

(6)

$$(1000)^2 = 2 \times 32\frac{1}{2} \times \text{height} =$$

$$\frac{1000000 \times \frac{3}{4}}{2 \times 193} = 15544\frac{8}{193} \text{ ft.} = 2 \text{ mi. } 4984\frac{8}{193} \text{ ft. } \textit{Ans.}$$

(7)

$$16\frac{1}{2} \times (3.2)^2 = \text{height or depth} = 164.69\frac{1}{2} \text{ ft. } \textit{Ans.}$$

(8)

$$16\frac{1}{2} \times (2.5)^2 = \text{height} = 100.52\frac{1}{2} \text{ ft. } \textit{Ans.}$$

(9)

The question is, from what height must a body fall to acquire a velocity of 160 ft.?

$$(160)^2 = 2 \times 32\frac{1}{2} \times \text{height ; height} =$$

$$\frac{(160)^2}{2 \times 32\frac{1}{2}} = \frac{25600}{2 \times 32\frac{1}{2}} = 768\frac{2}{3} = 397\frac{17}{19} ; 160 = 32\frac{1}{2} \times \text{time ;}$$

$$\text{Time} = \frac{160}{32\frac{1}{2}} = 4\frac{8}{19} = 4\frac{8}{19} \text{ sec. } \textit{Ans.}$$

(10)

$$5 \text{ sec.} = \text{time of ascent ; } 32\frac{1}{2} \times 5 = 160\frac{1}{2} = \text{velocity ;}$$

$$(160\frac{1}{2})^2 = 2 \times 32\frac{1}{2} \times \text{height ;}$$

$$\text{height} = \frac{(160\frac{1}{2})^2}{2 \times 32\frac{1}{2}} = \frac{93125}{2316} = 402\frac{1}{2} \text{ ft.}$$

(11)

$$\text{Height} = 16\frac{1}{2} \times (3\frac{1}{2})^2 = 197\frac{1}{8} \text{ ft. } \textit{Ar}$$

(12)

$$2500 = 32\frac{1}{8} \times \text{time}; \text{time} = \frac{2500}{32\frac{1}{8}} = \frac{15000}{193} = 77\frac{39}{193} \text{ sec. } A.$$

(13)

$$(350)^2 = 2 \times 32\frac{1}{8} \times \text{height};$$

$$\text{height} = \frac{(350)^2}{2 \times 32\frac{1}{8}} = \frac{367500}{193} = 1904\frac{28}{193} \text{ ft.};$$

$$350 = 32\frac{1}{8} \times \text{time}; \text{time} = \frac{350}{32\frac{1}{8}} = \frac{2100}{193} = 10\frac{170}{193} \text{ sec. } A.$$

(14)

$$3040 = 32\frac{1}{8} \times \text{time}; \text{time} = \frac{3040}{32\frac{1}{8}} = \frac{18240}{193} = 94\frac{98}{193} \text{ sec.}$$

(15)

$$\text{Velocity} = 32\frac{1}{8} \times 45 = 1447\frac{1}{2} \text{ ft.}$$

(16)

$$1970 = 32\frac{1}{8} \times \text{time}; \text{time} = \frac{1970}{32\frac{1}{8}} = \frac{11820}{193} = 61.24 + \text{ sec.}$$

(17)

$$3280 = 16\frac{1}{12} \times (\text{time})^2; (\text{time})^2 = \frac{3280}{16\frac{1}{12}};$$

$$\text{time} = \sqrt{\frac{3280}{16\frac{1}{12}}} = \sqrt{203.9377+} = 14.28+ \text{ sec. } Ans.$$

(18)

$$(984)^2 = 2 \times 32\frac{1}{8} \times \text{height};$$

$$\text{height} = \frac{(984)^2}{2 \times 32\frac{1}{8}} = \frac{2904768}{193} = 15050\frac{118}{193} \text{ ft.}$$

(19)

$$386 = 32\frac{1}{8} \times \text{time}; \text{time} = \frac{386}{32\frac{1}{8}} = \frac{2316}{193} = 12 \text{ sec.};$$

$$\text{height} = 16\frac{1}{2} \times (12)^2 = \frac{19^3}{12} \times 12 \times 12 = 2316 \text{ ft.}$$

(1)

$$93 - 82\frac{1}{2} = 10.5 \text{ gr., weight of an equal volume of water.}$$

$$93 \div 10.5 = 8.857 = \text{specific gravity.}$$

(2)

A cubic foot of the oak must weigh 925 ounces. Therefore,  
 $925 \text{ oz.} : 2240 \times 16 \text{ oz.} :: 1 \text{ cubic foot} : 38\frac{133}{8} \text{ cubic feet.}$

(3)

The compound weighs in air  $50 + 390 = 440 \text{ oz.}$  The weight of an equal volume of water is  $440 - 344 = 96 \text{ oz.}$  The weight of a volume of water equal to volume of the copper is  $390 - 345 = 45 \text{ oz.}$  Therefore, weight of volume of water equal to volume of the wax is  $96 - 45 = 51 \text{ oz.}$  Specific gravity of the pumice stone  $= 50 \div 51 = .980.$

(4)

Since the weight of the ice and of the displaced water are equal, we have  $20.45 \times 15.75 \times 10.5 \times .930 = 20.45 \times 15.75 \times \text{height of displaced prism of water} \times 1.026.$  Then, by cancelling,  $10.5 \times .930 = \text{height} \times 1.026$ ; hence,  $\text{height} = 10.5 \times .930 \div 1.026 = 9.517 \text{ yd.}$  Therefore,  $10.5 - 9.517 = 983 \text{ yd.}$   
 $= \text{height of ice above the surface} = 2 \text{ ft. } 11.383 \text{ in.}$

(5)

$$6043 \times 63 = 380709 \text{ lb.} = 190 \text{ T. } 709 \text{ lb.} = \text{weight of vessel.}$$

(6)

$$33 - 21 = 12 = \text{weight of an equal volume of water.}$$

$$33 \div 12 = 2.75 = \text{specific gravity.}$$

(7)

$$17 \div 2.35 = 7.234 = \text{specific gravity.}$$

(8)

$$250 \div 318 = .786 = \text{specific gravity of the alcohol.}$$

(9)

$$14 - 8 = 6 = \text{weight of water; } 13.25 - 8 = 5.25 = \text{weight of brandy; } 5.25 \div 6 = .875 = \text{specific gravity.}$$

(10)

$$2.837 \times 1000 = 2837 \text{ oz.} = 177 \text{ lb. } 5 \text{ oz.}$$

(11)

$$36.4 \div 33 = 1.103 = \text{specific gravity.}$$

## MARIOTTE'S LAW.

(1)

$$12.3 \text{ lb.} : 10 \text{ lb.} :: 4.3 \text{ qt.} : 3.49 \text{ qt.}$$

(2)

$$8 \text{ qt.} : 20 \text{ qt.} :: 15 \text{ lb.} : 37.5 \text{ lb.}$$

(3)

The density being directly proportional to the pressure, we have,

$$15 \text{ lb.} : 14.2 \text{ lb.} :: 2.6 \text{ gr.} : 2.46 \text{ gr.}$$

The density being diminished, the weight is diminished in the same proportion.

(4)

$$47 \text{ lb.} : 25 \text{ lb.} :: 1 : .5319.$$

